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# JOURNAL OF THE ARNOLD ARBORETUM

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VOLUME IV

JANUARY, 1923

NUMBER 1

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## MICHAUX'S EARLIEST NOTE ON AMERICAN PLANTS

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IN the year 1792 a note by A. Michaux on some rare and new plants of North America edited with critical observations by Lamarck was published on pp. 409-419 of volume I of the "Journal d'histoire naturelle rédigée par MM. Lamarck, Bruguière, Olivier, Haüy et Pelletier." This journal which was discontinued after volume II. seems to be very rare and Michaux's note has been therefore generally overlooked and neglected; only part of the new names are found in the Index Kewensis and only a few of them are mentioned in monographs and publications on American plants even when it had been the intention of the author to give a complete enumeration of synonyms. As Michaux's note, which is interesting as one of the earlier publications on American plants, is at present not accessible to the majority of American botanists, an exact reprint of the comparatively short article may follow here with the omission of the remarks of Lamarck on Michaux's activities as collector and traveler:

- p. 409 Notice de quelques plantes rares ou nouvelles observées dans l'Amérique Septentrionale, par M. A. Michaux; adressée à la Société d'Histoire Naturelle de Paris par l'auteur; et rédigée, avec des observations.

Par M. Lamarck.

Plantes remarquées en Amérique.

*Monandrie.*

1. *Canna Flava.* Cette plante habite les bords des rivières en Géorgie et en Floride.

*Diandrie.*

2. *Pinguicula Lutea.*

3. *Pinguicula Violacea.*

Ces deux espèces n'ont pas été décrisées, et se trouvent dans la Caroline.

4. *Salvia azurea.* Nouvelle sauge de six pieds de haut. On la trouve sur les rives de la rivière Sainte-Marie, en Géorgie.

*Tetrandrie.*

5. *Ilex Americana.*
6. *Ilex Cassine.*
7. *Ilex Augustifolia [sic].*
8. *Ilex Cassena vera.*
9. *Ilex Æstivalis.*

Tous les ilex d'Amérique sont dioïques. Dans l'ordre naturel, les deux dernières espèces n'ont point d'affinité avec les trois autres.

*Pentandrie.*

- p. 410 10. *Azalea Fulva.* C'est une variété de l'*Azalea nudiflora*.  
 11. *Azalea Pilosa;* floribus octandris, corollis ovatis, capsulis oblongis angulatis. *Folia pilosa*, ad apices nivea.  
 Cet arbrisseau habite les plus hautes montagnes de la Caroline, vers les sources de la rivière Catawba.  
 12. *Ipomæa Erecta*, foliis pinnatifidis.  
 Se trouve sur les bords de la mer, en Floride.  
 13. *Mussænda Frondosa.*  
 Corolla infundibuliformis. Capsula ovata, bilocularis. Cet arbrisseau me paroît dans l'ordre naturel avoir de l'affinité avec le quinquina. Les habitans de la Géorgie en font, en effet, usage comme du quinquina contre les fièvres. J'ai transporté dans le jardin de la Caroline, plusieurs plants de cet arbrisseau, qui y ont éprouvé un froid de six à huit degrés sans en être endommagé.
- p. 411. *Octandrie.*

14. *Vaccinium Ciliatum.*  
 Caulis erectus, foliis ciliatis. Corolla profunde quadripartita, laciniis revolutis. Stamina octo.  
 Cet arbrisseau habite le sommet des plus hautes montagnes de la Caroline septentrionale. Il est à remarquer que c'est la seule espèce connue en Amérique, ayant huit étamines.  
 15. *Lapathum Occidentale.*  
 Cet arbrisseau de la Géorgie en Amérique, a la plus grande affinité avec le *Lapathum orientale* observé par Tournefort dans la Géorgie Asiatique. Celui d'Orient, que j'ai vu en Perse, a huit étamines; et celui d'Amérique en a constamment dix.

*Enneandrie.*

- p. 412 Laurus *indica*. L'on a souvent cité pour *Laurus indica* une variété du *L. borbonia* à feuilles glabres, qui se trouve en Caroline. Le *Laurus indica* designé par Catesby, *cornus ad*, etc. ne se trouve qu'aux îles Bahame et aux parties méridionales de la Floride.

*Decandrie.*

16. *Rhododendron minus*, foliis minoribus ellipticis petiolatis subferrugineis.  
Se trouve sur les rives de la rivière de Savanah.
17. *Kalmia hirsuta*; foliis hirsutis.  
On le trouve dans la Géorgie et la Floride.
18. *Kalmia . . .* foliis alternis in petiolum desinentibus: margin'e reflexis; floribus aggregatis; corollis niveis fundo roseis.
19. *Andromeda polifolia*; foliis Rosmarini.  
Habite les montagnes de la Pensylvanie.
20. *Andromeda calyculata*.
21. *Andromeda paniculata*.  
Il y a plusieurs variétés de cette espèce.

- p. 413
22. *Andromeda racemosa*; floribus secundis, calycibus calyculatis.
  23. *Andromeda mariana*.
  24. *Andromeda arborea*.
  25. *Andromeda Wilmingtonia*; foliis ovatis crenatis, corollis cylindricis.
  26. *Andromeda axillaris*; foliis perennantibus, calycibus calyculatis.
  27. *Andromeda nitida*.
  28. *Andromeda ferruginea*.
  29. *Andromeda formosissima*. Voyez Bartram Stravel [sic].

*Diadelphie.*

30. *Robinia viscosa*.

Grand arbre des montagnes de la Caroline.

*Polygamie.*

31. *Nyssa montana*; foliis villosis.
32. *Nyssa aquatica*; foliis glabris.
33. *Nyssa dentata*; foliis denticulatis.
34. *Nyssa tomentosa* [sic] (ogechee de Bartram) foliis tomentosis incanis.

- p. 416
- Remarques sur quelques-unes des plantes  
de la notice ci-dessus.

No. 1. Ce *Canna flava* est-il vraiment différent du *Canna glauca*. L. qui croit dans la Caroline, qui a aussi les fleurs jaunes, mais pâles, et qui ne les a point ponctuées, comme la variété du *Canna indica* à fleurs jaunes, que j'ai citée dans mon dict. Voyez *Balisier*, no. 1, var. B.

No. 2. *Pinguicula lutea*. C'est vraisemblablement la même plante que celle dont j'ai donné la description dans le n° 9 de ce Journal (pag. 334, pl. 18, fl. 1), sous le nom de *Pinguicula campanulata*.

- No. 5. *Ilex Americana*. C'est peut-être le même que j'ai publié dans mon dict. sous le nom d'*Ilex laxiflora*. Voyez *Houx*, n°. 3.
- No. 9. *Ilex aestivalis*. Si c'est la même plante que celle que j'ai décrite sous le même nom dans mon dict. Elle est fort voisine des *Prinos*, et je pense même que c'est le *Prinos lucidus* de l'*Hortus kewensis*, pag. 378. Voyez le *Tableau des Houx*, dans mon *Illustr. des genres*.
- p. 417 No. 12. . . . Cet *Ipomaea* pourroit bien être le même que l' *Ipomaea rubra* de Linné, que je crois être une espèce de *Cantua*. Voyez *Cantu*, dans mon dict.
- No. 13. *Mussænda frondosa*. Je doute fort que cet arbrisseau de la Géorgie soit le même que celui des Indes orientales, qui porte le même nom, et dont les fruits sont pulpeux. *Gaertn.* les a figurés (t. 28, f. 5).
- No. 17. *Kalmia hirsuta*. Il y a apparence que c'est l'arbuste que j'ai décrit sous le même nom, d'après des exemplaires secs que je possède de la Caroline, et qui m'ont été communiqués par M. Fraser. Voyez *Kalmie velue*, n°. 3, dans mon dict. vol. 3, p. 343.
- No. 23. *Andromeda mariana*. Cette belle espèce, dont j'ai donné la description dans le premier volume de mon dict. (p. 156, n°. 8), a été depuis figurée par M. Vogel (*ic. rar. tab. 107, f. 1*); mais l'*Andromeda mariana* de M. Jacquin (*collect. vol. 2*, p. 326, *ic. rar. vol. 2*) est tout autre chose. C'est une nouvelle espèce que j'ai décrite le premier dans le 1<sup>er</sup>. volume de mon dict. sous le nom d'*Andromeda lucida*, n°. 9. Il y a apparence que cette espèce est la même que l'*Andromeda coriacea* de l'*Hort. kewensis*, et que l'*Andromeda nitida*, n°. 27 de cette notice.
- p. 418 No. 29. *Andromeda formosissima*. Je crois que cette andromède est la même que j'ai nommée *Andromeda populifolia* (dict. vol. 1, p. 159, n°. 14) et que depuis M. Jacquin a décrite et figurée sous le nom d'*Andromeda lucida* (*collect. vol. 1*, p. 95, *et ic. rar. vol. 1*). Enfin, depuis M. Jacquin, cette même plante a été mentionnée dans l'*Hortus kewensis*, sous le nom d'*Andromeda acuminata*. Quelle confusion ne doit pas produire cette mutation continue dans les noms assignés aux plantes par ceux qui en ont traités les premiers?
- Au reste, pour terminer les observations que j'ai à faire sur le succès des recherches de M. Michaux, je dirai que j'ai connaissance p. 419 de plusieurs plantes intéressantes qu'il a découvertes, et dont il ne fait point mention dans la notice exposée ci-dessus. D'où je conclus que cette notice, quoique déjà intéressante par les objets qu'elle indique, est bien éloignée de donner une idée complète de tous les services que M. Michaux rendra à la Botanique, et même

à toutes les parties de l'Histoire Naturelle, par les observations et les découvertes qu'il a faites et qu'il continue de faire dans ses voyages.

#### REMARKS ON THE NAMES IN MICHAUX'S NOTE

1. *Canna flava*. This can not be any other species than *C. flaccida* Roscoe (in Trans. Linn. Soc. VIII. 339 [1807]), to which it is referred in Index Kewensis. As it is a nomen nudum, Roscoe's name will stand. No Canna is described in Michaux's Flora.

2. *Pinguicula lutea* is the *P. lutea* Walter of Michaux's Flora (I. 11), of which *P. campanulata* Lamarck is a synonym.

3. *Pinguicula violacea* is probably *P. pumila* of Michaux's Flora (I. 11) the flower of which is described as "pallide violacea." Not cited in Index Kewensis.

4. *Salvia azurea*. This name as published here must be considered a nomen nudum and for the first valid publication of it credit should be given to Vahl (Enum. Pl. I. 253 [1805]); Lamarck's publication of the name, though volume VI. of the Encyclopédie Méthodique bears the date 1804, is later, as shown by the fact that he quotes Vahl's description; in volume VI. as in other volumes of the Encyclopédie the date of the title page is correct only for the first part of the volume, while the second part was not published until the following year. Vahl's work came out probably early in 1805, if not at the close of 1804, as the preface is dated July, 1804. This Sage was first described by Walter in 1788 who identified it erroneously with *S. mexicana* of Linnaeus and again in 1800 by Ventenat (Descr. Pl. Jard. Cels. 50 t. 50) under the name *S. acuminata*, a name preoccupied by *S. acuminata* Ruiz & Pavon; Vahl quotes Ventenat's name as *S. acuminatissima*, an erroneous citation repeated by several later authors.

5. *Ilex americana* is according to Lamarck's note probably the same as his *I. laxiflora* which is a synonym of *I. opaca* L. under which it appears in Michaux's Flora (II. 228). *Ilex americana* is not mentioned in Index Kewensis, but Loesener (Nov. Act. Carol.-Leop. Acad. LXXVIII. 152 [1901]) cites it as a synonym of *I. opaca*.

6. *Ilex Cassine* is without doubt *Ilex Cassine* L. which appears in Michaux's Flora as *I. Dahoon* Walter.

7. *Ilex angustifolia* is probably the *Ilex* which appears in Michaux's Flora as *I. myrtifolia* Walter and is now generally referred to *I. Cassine* as var. *myrtifolia* Sargent. To judge from the description in Michaux's Flora it is not the *I. angustifolia* Willdenow (Enum. Pl. Berol. I. 172 [1809]) which is *I. Cassine* var. *angustifolia* Aiton.

8. *Ilex Cassena* vera is *I. Cassena* of Michaux's Flora (II. 229) which is *I. vomitoria* Aiton.

9. *Ilex aestivalis* is apparently the same as *I. aestivalis* Lamarck (Encycl. Méth. III. 147 [1789]) which is according to Poiret (Suppl. Encycl.

Méth. III. 65 [1813]) identical with *I. prinoides* Aiton of Michaux's Flora (I. 229), a synonym of *I. decidua* Walt.

10. *Azalea fulva* is apparently *A. calendulacea* var.  $\alpha$  *flammea* of Michaux's Flora (I. 151) which has been referred by me (in Wilson & Rehder, Monog. Azaleas, 131 [1921]) to *Rhododendron speciosum* (see also I.c., foot-note 2).

11. *Azalea pilosa* is *Menziesia Smithii* of Michaux's Flora for which the correct name is *Menziesia pilosa* Jussieu.

12. *Ipomoea erecta*. This is apparently the plant described in Michaux's Flora (I. 142) as *Ipomopsis elegans* and now referred to the genus *Gilia* as *G. rubra* Hell. (*G. coronopifolia* Pers.). The name does not appear in Index Kewensis where only *I. erecta* R. Br. is cited; R. Brown's name will not be invalidated by the earlier homonym, as the latter is a synonym of the still earlier *Polemonium rubrum* L. which is now *Gilia rubra* Heller.

13. *Mussaenda frondosa* is an earlier name for *Pinckneya pubens* of Michaux's Flora (I. 105), but the name is not valid as there is an older *Mussaenda frondosa* of Linnaeus. *Mussaenda frondosa* Michaux is not cited in Index Kewensis nor is it mentioned as a synonym of *Pinckneya pubens* in Sargent's Silva or in the North American Flora.

14. *Vaccinium ciliatum*. This is the oldest name for *V. erythrocarpum* of Michaux's Flora (I. 227) but as there exists the older valid name *V. ciliatum* Thunberg, *V. erythrocarpum* will stand. *Vaccinium ciliatum* Michaux is not in Index Kewensis and is not mentioned in Gray's Synoptical Flora.

15. *Lapathum occidentale* is without doubt *Cliftonia monophylla* Britton. *Lapathum* is a Tournefortian genus referred by Linnaeus to *Rumex*, but Tournefort's *Lapathum orientale* with which Michaux compares our species is *Atraphaxis frutescens* K. Koch (*Polygonum frutescens* Linnaeus). The similarity of the fruit which has given rise to the vernacular name "Buckwheat-tree" for Cliftonia apparently led Michaux to refer our plant to the same genus as *Lapathum orientale* which he had observed in Persia. The name *Lapathum occidentale* is not mentioned in Index Kewensis and the plant is not described in Michaux's Flora.

\* *Laurus indica* is apparently the *Laurus Catesbyana* of Michaux's Flora (I. 244) now *Ocotea Catesbyana* Sargent, while the glabrous variety found in Carolina of *Laurus borbonia* which Michaux says is often erroneously called *L. indica* is the *Laurus carolinensis* of his Flora (I. 245) now referred to *Persea borbonia* Sprengel.

16. *Rhododendron minus* is *R. minus* of Michaux's Flora (I. 258) and is the oldest name for *R. punctatum* Andrews as stated by me in 1912 (Rhodora, XIV. 100).

17. *Kalmia hirsuta* is *K. hirsuta* Walter of Michaux's Flora (I. 257).

18. *Kalmia . . .* is apparently the *K. cuneata* of Michaux's Flora (I. 257).

19. *Andromeda polifolia* is apparently *A. glaucocephala* Link, as Michaux gives the mountains of Pennsylvania as the habitat of the species; in his

Flora (I. 254) he cites only mountains near Hudson Bay, which is the region for the true *A. polifolia* Linnaeus.

20. *Andromeda calyculata* is *A. calyculata* Linnaeus of Michaux's Flora (I. 254) which is now *Chamaedaphne calyculata* Moench.

21. *Andromeda paniculata* is the *A. paniculata* of Michaux's Flora (I. 254) for which he cites erroneously Linnaeus as the author. It is now *Lyonia ligustrina* (L.) DeCandolle.

22. *Andromeda racemosa* is *A. racemosa* Linnaeus of Michaux's Flora (I. 255) now *Leucothoe racemosa* Gray.

24. *Andromeda arborea* is *A. arborea* Linnaeus of Michaux's Flora (I. 255), now *Oxydendrum arboreum* DeCandolle.

23. *Andromeda mariana* is *A. mariana* Linnaeus of Michaux's Flora (I. 256), now *Lyonia mariana* D. Don.

25. *Andromeda wilmingtonia*. This name does not appear in Michaux's Flora and is not enumerated in Index Kewensis. Though the description is very short, and partly, as to the description of the shape of the corolla, misleading, there can be hardly a doubt that this plant represents the *A. speciosa* var.  $\alpha$  *nitida* of Michaux's Flora (I. 256), under which Wilmington is cited as one of the two localities where Michaux observed the plant. The description of the corolla as cylindric indicates that the flowers of Michaux's specimen had not yet fully opened, and in bud the shape of the corolla is cylindric becoming campanulate when open. Fortunately the question whether the name should be accepted or rejected is of little importance as there exists the older name *A. pulverulenta* Bartram (Travels, II. pl. opp. p. 476 [1791]), now generally referred to Zenobia as *Z. pulverulenta* Pollard. If, however, the name *A. pulverulenta* Bartram is rejected as a nomen seminudum, *A. wilmingtonia* will be the next oldest name, or if the green form and the glaucous form are considered distinct species *A. wilmingtonia* will be the oldest name for the green form.

26. *Andromeda axillaris* is the *A. axillaris* Lamarck of Michaux's Flora (I. 253), now *Leucothoe axillaris* D. Don.

27. *Andromeda nitida* is *A. nitida* Bartram of Michaux's Flora (I. 252), for which the oldest name is *A. lucida* Lamarck, now *Pieris lucida* Rehder (Mitteil. Deutsch. Dendr. Ges. xxiv. 226 [1915]), where complete synonymy is given.

28. *Andromeda ferruginea* is *A. ferruginea* Walter of Michaux's Flora (I. 252) which is now *Lyonia ferruginea* Nuttall.

29. *Andromeda formosissima* is *A. laurina* of Michaux's Flora (I. 253) for which the oldest name is *A. acuminata* Aiton, now *Leucothoe acuminata* D. Don.

30. *Robinia viscosa* is *R. viscosa* of Michaux's Flora (II. 65). This is the first mention of the name *R. viscosa* but as it is not accompanied by a description, Ventenat remains the author of the name, as his publication of the name is earlier than Michaux's description in his Flora (II. 65).

31. *Nyssa montana* is apparently the *N. villosa* of Michaux's Flora (II. 258) under which *N. montana* Hort. is mentioned as a synonym and

belongs to *N. sylvatica* Marshall. It is no doubt identical with *N. montana* hort. ex Pursh cited in Index Kewensis, but not with *N. montana* Gaertner which is referred to *N. ogeche*.

32. *Nyssa aquatica* is apparently the *Nyssa biflora* Walter of Michaux's Flora (II. 259).

33. *Nyssa dentata* is probably referable to *N. aquatica* L. which has more often dentate leaves than any of the other species. The name does not appear in Index Kewensis.

34. *Nyssa tomentosa* is apparently not the *N. tomentosa* of Michaux's Flora which is *N. aquatica* Marshall, but the *N. candicans* of Michaux's Flora (II. 259) which is the same as *N. tomentosa* Poiret and the *N. ogeche* Marshall. In both places, under *N. tomentosa* in the Journal and under *N. candicans* in the Flora the word "Ogechee" appears and in the description the words "foliis . . . incanis" in one place and "foliis . . . subcandanticantibus" in the other indicate the identity.

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## THE RED RIVER FOREST AT FULTON, ARKANSAS

ERNEST J. PALMER

IN the course of botanical explorations conducted by the Arnold Arboretum in the southern and southwestern states several localities have been found so remarkable for the richness and variety of their ligneous flora as to appear worthy of brief description. These silvan centers or natural arboreta, as they may almost be termed, usually occur, as might be expected, in places where a considerable diversity of soil, moisture, drainage, light and other ecological conditions prevail within narrow limits. In addition to affording unusual opportunities for the observation and collection of a variety of trees and shrubs, some of them comparatively rare or growing beyond the limits of their generally recognized range, such localities are of especial interest as compact fields for the study of natural forest conditions in their various phases and for the evidence they furnish or suggest regarding certain changes that have occurred or are in progress in the composition and distribution of the plants of our forest flora.

About great trees and ancient forests there is something sublime and inspiring that appeals to all fine natures. In the silence and shadows of the great woods one instinctively feels a sense of tranquillity and seclusion from the busy world. There is a suggestion too of permanence and stability and quiet dignity. These values for us are real, but if we probe a little deeper we soon discover that the apparent inactivity is illusionary and but the result of a slower change than in the world of animate life. For here too is unceasing struggle and progress. Could we read the history of the forest in all its details it might be almost as replete with dramatic interest as any account of human events. There would be records of the rise and fall of dynasties, of long campaigns, conquests,

great migrations and sudden catastrophes. It would contain episodes of bold adventure and sudden turns of fortune, and accounts would not be lacking of ancient feuds, of friendships and firm alliances. The annals of these strange events are written in an obscure and varied language, but for the characters of which science is finding a key and enabling us to piece together portions here and there. Its early fragmentary records, impressed upon clay or inscribed upon stone lie deep buried in hills and plains. But in the living forests also the runic lines are scattered about and may often be read in characters of leaf and bud and flower, in atavisms and reverersions toward ancient types, in strange associations and chains from which many links are missing. Here we come across small colonies isolated in some retreat far removed from their kind and kindred, and there we find in our northern forest a single representative of a tropical family or a species that appears to have survived from an earlier period. These larger questions and the romance of science they involve are, to be sure, somewhat beyond the scope of the present paper, which proposes only to describe briefly the ligneous flora of a small area particularly rich in species of the southern forest belt. Such localities, however, are replete with suggestions and evidence regarding the history and evolution of our floras. Nor could we hope to find even in the rich luxuriance of the tropical jungles nor amid the weird forms of the antipodal desert more interesting fields for investigating such questions than in our familiar American forests.

In that magnificent forest that but a century or so ago covered nearly all of eastern North America from the valley of the St. Lawrence and the Lakes to the Gulf of Mexico beyond the Mississippi, civilization and settlement have made great changes. Vast areas have been cleared and brought under agriculture. Axe and saw and fire-brand employed unceasingly have laid low magnificent stands of conifers and hard wood species; swamps have been drained and mountain sides denuded and cities and towns now flourish where was lately the heart of the wilderness. Beneficent as this progress in the main doubtless is, even though, as we are often reminded, it was prosecuted in many cases with little regard to present economy or future need, yet one cannot help reflecting with regret upon the tremendous interest and value that would have attended a comprehensive survey of the whole region under modern scientific methods, had such a thing been possible, while it was still practically intact. Even now, although we are beginning to take stock of what remains and to talk of conservation and reforestation, in many of the more recently settled parts of the country the work of destruction goes on unchecked. In travelling through portions of the South and Southwest one still commonly sees crops of cotton and corn planted in "deadenings," where the smaller plants have been cleared away and thousands of splendid specimens of Oaks, Hickories, Elms, Gums and other trees have been "girdled" and left to slow decay. One still sees in such sections each spring huge piles of logs and brush brought together to be burned and got rid of as so much

incumbrance to the land. In the lumbering districts it is not uncommon to see merchantable timber being felled and removed at the lowest possible present cost without regard to conserving the younger growth, which indeed is often later wantonly destroyed by fire, leaving large tracts as barren wastes incapable of reforesting themselves and quite worthless for agricultural or even for grazing purposes. In other sections the work of drainage and levee building is restricting more and more the swamp lands where formerly the Bald Cypress and other species flourished. Even where detached areas of the forest remain, almost everywhere within the region we are considering, many of the finer and more valuable trees have been culled out, and often in the vicinity of cities or centers of industry certain species are nearing extinction and others of foreign introduction are becoming mixed with the native growth. In spite of all these inroads, however, we of the present generation may still congratulate ourselves on the fact that in many remote places considerable remnants of the forest do remain, where it is possible to observe many phases of it practically under primitive conditions. It is perhaps needless to point out that the botanists of the future will not be so fortunate; for even though present destructive tendencies should be checked and the reverse prevail, the things restored will not be as they were in the beginning, and planting or even scientific forest management, desirable as they may be, must destroy to some extent the natural, primitive conditions so important to the scientific investigator.

Among localities in the southern portion of the great forest belt of eastern North America, which have been somewhat thoroughly explored by representatives of the Arnold Arboretum within the last few years, the following may be mentioned as examples in various ways possessing exceptional interest for the dendrologist. The vicinity of Selma, Dallas County, Alabama; the valley of White River and its tributaries in the Ozark region of southern Missouri and northern Arkansas; a section of the Kiamichi Mountains near Page, Le Flore County, Oklahoma; the canyons of the Guadalupe, Sabinal, Frio, Nueces and other streams in the Edwards plateau of southwestern Texas; the vicinity of San Augustine, in eastern Texas, and that of Fulton, on Red River, in southwestern Arkansas.

Considerable work has been done by agents of the Arboretum in each of these localities, the results of which is represented by large collections preserved in the herbarium; many interesting trees and shrubs brought into cultivation here for the first time and descriptions of a number of species and varieties new to science that have appeared in its publications from time to time.

Selma, Alabama, which has furnished one of the largest lists of woody plants of any locality in the United States, has not been visited by the writer. Professor R. S. Cocks, of Tulane University, and Mr. T. G. Harbison, however, have made large collections there and Professor Sargent has also visited it. A brief account of some of the peculiar plants

of the Edwards plateau was published in a former issue of this Journal (I. 233-239), although the list was an incomplete one; in another number (II. 216-232) mention was made of the interesting plants of the White River valley, and in the present paper it is proposed to give some account of the rich ligneous flora in the vicinity of Fulton, Arkansas.

The village of Fulton is situated on the west bank of Red River a short distance below the mouth of Little River. It is a station on the Missouri Pacific railway about 28 kilometers (18 miles) from the thriving town of Texarkana. In the steamboat days and before the coming of the railroads it was a trading and shipping point of some importance on account of the extensive cotton plantations in the fertile valley. During the civil war it was fortified by the Confederates in an attempt to hold the river against the advance of the Union gun boats. The trenches and gun pits on the hills above the town are still plainly visible. The present population is about five or six hundred, a large percent of which is colored. The village is protected by a levee, as otherwise it would be completely inundated by the river when it reaches flood stage, which usually occurs once or more a year. The river here forms the boundary between Hempstead and Miller Counties. It is spanned by a large railway bridge but for other crossing only a ferry is available. In the life of the community the big muddy stream is a dominating factor. To it is due the fertility of the valley and the big crops of cotton, and prosperity when seasons are favorable. But the flood demon in his angry moods is a constant menace to both planters and townfolks, assailing and often carrying off large sections of the low silt river banks and not infrequently devastating the whole wide valley with the tremendous volume of water that come down from the spring freshets in Texas and Oklahoma; and if in the immediate vicinity of the town he has been baffled of his prey by the defensive works of man he takes mean revenge in such small annoyances as mosquitos and malaria.

Opposite the town, on the Miller County side, is an extensive bottom, in places four to six kilometers wide. Much of the land has been brought under agriculture and portions of it are protected by double courses of levees, but there are still extensive tracts of semi-swamp lands covered with characteristic forest. The higher portions are occupied by open woods containing comparatively few species, amongst which *Populus balsamifera* var. *virginiana* Sarg., *Carya pecan* Engl. & Graebn., *C. cordiformis* K. Koch, *C. ovata* K. Koch, *C. myristicaeformis* Nutt., *C. Buckleyi* var. *arkansana* Sarg., *Quercus alba*, L., *Q. macrocarpa* Michx., *Q. rubra* L., *Q. Shumardii* Buckley, *Ulmus american* L., *U. crassifolia* Nutt., *U. alata* Michx., *Celtis laevigata* Willd., *Liquidambar Styraciflua* L., *Nyssa sylvatica* Marsh., *Acer Negundo* var. *texana* Sarg., *Fraxinus americana* L. and *F. pennsylvanica* var. *lanceolata* Sarg. are most abundant. Some fine specimens of *Quercus Durandii* Buckl. are occasionally found, usually occupying slight elevations, and amongst smaller trees, growing where the dominant species are less crowded or are an underworth in strict sub-

junction to them, may be mentioned *Carpinus caroliniana* Walt., *Ostrya virginiana* K. Koch., *Cornus asperifolia* Michx., *Diospyros virginiana* L., *Bumelia lanuginosa* Pers., *Prunus mexicana* Wats., *Crataegus viridis* L., *C. spathulata* Michx. and *Cercis canadensis* L. There is generally here but slight development of shrubs or herbaceous plants. *Ilex decidua* Walt., *Benzoin aestivale* Nees, *Forestiera acuminata* Poir. and *Callicarpa americana* L. are abundant in places, and sometimes about the roots of a large tree on a low mound smaller shrubs, such as *Arundinaria macrosperma* Michx. and species of *Rubus* and *Vaccinium* find foothold. Commonest of all, however, is the Palmetto, *Sabal minor* Pers., which often covers large areas where the tree growth is not too dense. Woody vines also play a very subordinate rôle. The commonest ones noted here are the Grapes, *Vitis cinerea* Engelm. and *V. cordifolia* Michx., the Virginia Creeper, *Parthenocissus quinquefolia* var. *hirsuta* Planch., *Rhus Toxicodendron* L., *Berchemia scandens* Trel. and *Brunnichia cirrhosa* Banks.

In these low woods the trees generally develop slender straight trunks and the stand is often heavy. Many of them attain a large size, and while much culling has now been done, especially among the species most valuable for lumber, some magnificent specimens of Cottonwood, Oaks, Elms, Hickories and Gums may yet be found.

Numerous bayous and small lakes, often vestiges of former river channels, are encountered, and along their margins and in shallower depressions real swamp conditions prevail. Along the banks of the river and smaller bodies of water the tall stems of the Black Willow, (*Salix nigra* var. *altissima* Sarg.) is very common. Specimens 30 meters tall and more than a meter in diameter are not rare. This tree grows here with a straight clear trunk and has thick, very deeply fissured bark. Characteristic of the real swamp areas and depressions where water remains for a considerable part of the year are The Bald Cypress (*Taxodium distichum* Rich.), Swamp hickory (*Carya aquatica* Nutt.), Water Oak (*Quercus nigra* L.), Overcup Oak (*Q. lyrata* Walt.), Water Elm (*Planera aquatica* Gmel.) and Swamp Honey Locust (*Gleditsia aquatica* Marsh.). Common also to this habitat are *Carpinus caroliniana* Walt., *Liquidambar Styraciflua* L., *Crataegus viridis* L., *Acer rubrum* L. and *Fraxinus pennsylvanica* var. *lanceolata* Sarg. Amongst smaller growth is the Palmetto, Small Cane (*Arundinaria macrosperma* Michx.), *Itea virginica* L., *Forestiera acuminata* Poir. and *Cephalanthus occidentalis* L., the last two species often forming extensive thickets. Rank growths of sedges, grasses, rushes, ferns and other aquatic herbaceous plants often accompany these. The margins of some of these swampy lakes are almost tropical in appearance, with various species of lofty trees interspersed with a tangle of shrubs and vines coming down to the water's edge, among them Bald Cypress with straight columnar trunk rising from a buttressed base, sometimes four or five meters in diameter and well out in the water, surrounded by a grotesque assemblage of the aerial root cones, commonly known as "knees," and little mounds

of islands formed about great rotting stumps and linked together by a criss-cross of moss-grown logs, upon all of which small shrubs, tufts of grass and a variety of other plants are growing, while the surface of the stagnant water is covered with a thick scum of green algae, Riccias, Lemnas and sometimes *Azolla caroliniana*. This miasmic tranquillity is occasionally disturbed by a turtle gliding off a log or a moccasin or cottonmouth uncoiling and sliding lazily into the slime. Some of these bayous abound in fish, and alligators were formerly and I believe are still occasionally found in them. Some giant alligator-gars have been taken in Red River at Fulton. Besides some aquatic birds and frogs little other animal life is now to be seen about the swamps.

Before leaving the low woods it should be explained that the whole area we have been describing is subject to inundation whenever the river is at flood stage, and usually for weeks or even months during the spring and early summer water stands from one to six or more decimeters over the higher flat portions often leaving its uniform mark upon the tree trunks after it has receded. Later in the season most of the land becomes quite dry while the water is restricted to the lakes and bayous.

On the opposite side of the river, in Hempstead County, an escarpment rises with a maximum height of about six or eight meters above the first terrace approaching to within about half a kilometer of the stream just north of Fulton. This escarpment, obviously representing an old bank of the river, is capped with clay and gravel of the Pliocene period (Lafayette). The pebbles and boulders of silicious rock are thoroughly rounded and water worn, and were evidently originally derived from the Paleozoic deposits of the Ouachita Mountains to the northward. Beneath the Tertiary clay and gravel are beds of soft marly fossiliferous sandstones alternating with clays, which outcrop along the margins of the elevation and in deep ravines somewhat farther north, as will be mentioned later. The uplands, of which the escarpment at Fulton forms the southern boundary, extend westward to the valley of Little River and northward toward the Little Missouri. The surface is generally flat and where the clay and gravel deposit is present the soil is of low fertility and the drainage poor. After the heavy spring and autumn rains water stands for some time in every slight depression, and after it has disappeared the ground becomes hard and baked. Here is developed the typical "flat woods," composed of a mixed growth of Pine and deciduous trees. Two species of Pine are present, *Pinus taeda* L. and *P. echinata* Mill. The former is much more abundant than the latter, in places forming a large percentage of the forest and even developing pure stands over small areas. Amongst broad-leaved trees Hickories and Oaks are most abundant, both in individuals and number of species. Characteristic deciduous species here are *Carya alba* K. Koch, *C. Buckleyi* var. *arkansana* Sarg., *C. ovalis* var. *obcordata* Sarg., *C. myristicaeformis* Nutt., *Quercus alba* L., *Q. stellata* Wang., *Q. phellos* L., *Q. rubra* L., *Q. Shumardii* Buckl., *Ulmus alata* Michx., *Liqui-*

dambar *Styraciflua* L., *Prunus mexicana* Wats., *Crataegus spathulata* Michx., *C. apiifolia* Michx., *Nyssa sylvatica* Marsh. and *Fraxinus americana* L. In the uplands as in the low woods the slight development of the lower layer of shrubs and herbaceous plants is noticeable. Small patches or single individuals of such minor trees and shrubs as *Prunus* and *Crataegus*, *Ilex decidua* Walt., *Vaccinium arboreum* Marsh., *Rubus Andrewsianus* Blanch., *Rhus copallina* L. and *Rosa setigera* Michx. are sometimes found along the borders or in the more open portions. Grasses and herbaceous flowering plants are generally almost entirely absent. In a few larger openings, on the banks of streams and along the escarpment many other species appear and something like thickets with a tangle of shrubs and vines is developed. In such places grow several additional species of *Crataegus* of the *Crus-galli*, *Virides* and *Punctatae* groups, *Malus ioensis* var. *Palmeri* Rehd., *Zanthoxylum Clava-Herculis* L., *Cercis canadensis* L., *Diospyros virginiana* L., *Bumelia lanuginosa* Pers., *Smilax bona-nox* L., *Berchemia scandens* Trel. and *Ampelopsis arborea* Koehne. Many kinds of non-woody flowering plants also manage to thrive here. Where the clay and gravel are much eroded, as is sometimes the case on steepish hillsides, a somewhat more xerophytic phase of the flora is developed. *Juniperus virginiana* L., *Maclura pomifera* Schneid., *Berchemia scandens* Trel. and *Cocculus carolinus* DC. seem at home here, and some of the herbaceous species are even more characteristic, such as *Ophioglossum Engelmanni* Prantl, *Agave virginica* L. and *Opuntia humifusa* Raf.

Where the Lafayette gravel and clay is absent and the Cretaceous formations appear on the surface, conditions are very different. The soil is of a loose sandy loam, often quite fertile on account of the shell-marl and humus which it contains. The surface is easily eroded and often deep gullies and canyons are found working back into the plateau. Perennial springs issue in some of these hollows, and their banks are clothed with many species of ferns, flowers and shrubs. Sometimes remnants of the gravel and clay cap the domes or ridges between the ravines, and there is a descending scale of sterile gravelly flat, sandy slopes, deep protected banks and lower down perhaps a sandy bog bordering a stream or bayou. It is in such situations that the peculiarly rich flora has developed and many of the rare plants are found. A short distance southwest of the railway station at the village of McNab, near the junction of Yellow Creek and Little River, these conditions are typically developed. A deep cut in the railway grade gives an excellent exposure of part of the geologic section. Layers of soft sandstone from one to two meters thick, carrying many large calcareous oyster shells and other fossils, were seen with five or six meters of fine unconsolidated sand above and a similar deposit beneath. Near the point where the railroad crosses Little River the valley is bounded by a bluff, the highest and most precipitous to be found in the vicinity. At the highest point it rises perhaps 18 to 20 meters above the valley, and as it has a northern exposure and a slope of from 60 to 75

degrees it is a most favorable situation for the growth of many plants. Near the top of this bluff and along the gravelly ridge above is found one of the rarest of American Oaks, *Quercus arkansana* Sarg. This is near the type locality where it was first discovered by Mr. B. F. Bush in 1909. It is a small tree, seldom exceeding 10 meters in height with a trunk diameter of 50 centimeters. It has rough dark furrowed bark resembling that of the Black Oak. The foliage is somewhat similar to that of *Quercus marilandica* but the leaves are much smaller, thinner and of a distinct pattern. Its small fruit suggests affinities with *Quercus nigra*, but it certainly is not a hybrid between them, and is indeed a very distinct species. Within a radius of six or seven kilometers of the village of McNab I have examined carefully scores of specimens of this curious Oak, and doubtless many hundreds could be found, but it appears to be strictly limited to the sand hills and small streams traversing them in the Fulton region. Since becoming acquainted with it several years ago I have made diligent search for it in other localities in Arkansas and surrounding states where conditions appeared favorable, but so far it has proven entirely fruitless. An interesting sequel is, however, that it has apparently been found near Troy, Pike County, Alabama, where it was collected as long ago as 1880 by Dr. Chas. Mohr, and in 1912 and 1913 by Dr. Roland M. Harper. Dr. Harper's specimens in the Arnold Arboretum Herbarium represent both the young leaves and flowers and the mature leaves with a single fruiting cup. On Dr. Mohr's specimen, taken on July 4th, the leaves are mature and fruit about half grown. In these specimens the leaves are rather thinner and more nearly glabrous than in most of those from the Fulton region, but some of the specimens from McNab closely match them in these respects. In leaf type, scales of the fruit cup, winter buds and other characters there is close resemblance. Indeed there is fully as great a range of variability in all these respects between different specimens taken near the type locality as between the type specimens and those from the Alabama trees. Since the two localities are so far removed from each other and, so far as present knowledge goes, *Quercus arkansana* is comparatively rare and quite local at both places, the circumstance is very interesting and its significance will be referred to later in this article.

Other Oaks growing along the upper portion of the bluff at McNab and on the ridge above it are *Quercus marilandica* Muench., *Q. alba* L., *Q. Muhlenbergii* Engelm., *Q. Durandii* Buckl. and *Q. stellata* Wang. and a hybrid between the last two species, represented by a single tree, also occurs. It is a tree 8 or 9 meters in height, with pale, slightly flaky bark, more nearly resembling that of *Q. Durandii*. The variable leaves and the fruit are quite intermediate between the two supposed parents, both of which are growing in close proximity to the hybrid. Lower down on the bluff are some fine specimens of *Quercus Shumardii* Buckl., and *Q. phellos* L., *Q. nigra* L. and *Q. lyrata* Walt. are all growing in low ground just below its base. On the dryer portions of the bluff are

also found *Juniperus virginiana* L., *Pinus taeda* L., *Ulmus alata* Michx., *Celtis laevigata* var. *texana* Sarg., *Morus rubra* L., *Ostrya virginiana* K. Koch, *Diospyros virginiana* L., *Bumelia lanuginosa* Pers., *Fraxinus americana* L., *Rhamnus caroliniana* Walt. and *Viburnum rufidulum* Raf. Growing usually lower down on the protected slopes are *Arundinaria tecta* Michx., *Sassafras officinale* Nees & Eberm., *Carpinus caroliniana* Walt., *Liquidambar Styraciflua* L., *Nyssa sylvatica* Marsh., *Cornus racemosa* Raf., *Ilex decidua* Walt., *I. caroliniana* Trel., *Hamamelis macrophylla* Pursh, *Cercis canadensis* L., *Robinia Pseudoacacia* L., *Tilia floridana* Small, *Acer saccharum* var. *glaucum* Sarg. and *Fraxinus quadrangulata* Michx. Of the species enumerated above *Ilex caroliniana* is apparently rare and local, not having been noted elsewhere in the vicinity, although it might probably be found in similar situations. *Hamamelis macrophylla* is also comparatively rare here, but is found more abundantly along small sandy creeks in the vicinity. *Robinia Pseudoacacia* is rather abundant and is certainly native here, although beyond the range usually assigned to it. Of *Fraxinus quadrangulata* there are a number of medium sized trees growing well down towards the base of the bluff. So far as I know this station is the farthest southwest at which it has been found.

A large number of herbaceous plants, some of them apparently quite local, are growing along the bluff, and there is the same curious mingling of northern and southern forms amongst them as in the ligneous species. On the dry ridges and in the deep ravines in the immediate vicinity of this bluff are the type localities of *Prunus mexicana* var. *fultonensis* Sarg., a quite distinct variety of the "Big Tree" Plum; of *Aesculus Bushii* Schneider, a hybrid between *Ae. glabra* var. *leucodermis* Sarg. and *Ae. discolor* var. *mollis* Sarg.; of *Crataegus brachyphylla* Sarg., *C. lacera* Sarg. and of *C. notha* Sarg., the last a hybrid between *C. apiifolia* Marsh. and *C. brachyphylla*. Another interesting tree found in this vicinity is *Sophora affinis* T. & G., a southern species most abundant on the limestone hills of central and western Texas. Here it grows on the top and slopes of the gravelly ridges, where it attains a medium size for the species and flowers and fruits freely.

Descending into the moist sandy ravines we find, especially on the north sides, the banks clothed with ferns and herbaceous flowering plants and such shade loving woody species as *Erythronium americanum* L. and *Vaccinium virgatum* Ait. In such situations is often found the delicate little Partridge Berry (*Mitchella repens* L.) and sometimes such Orchids as *Hexalectris*, *Spiranthes* and *Corallorrhiza*.

The springs that issue from some of the deeper of these canyons and the quantities of fine sand and humus eroded through their action and that of the intermittent floods spread out over the low grounds in the valleys and form bogs. These sometimes have quite a characteristic flora. Typical of such situations and their environs are *Myrica cerifera* L., *Itea virginica* L., *Amorpha paniculata* T. & G., *Alnus rugosa* K. Koch,

*Lyonia ligustrina* DC., *Vaccinium corymbosum* L., *Rhododendron oblongifolium* Millais, and *Styrax americana* Lam. The Small Cane (*Arundinaria macrosperma* Michx.) and the Palmetto (*Sabal minor* Pers.) are also found here. Amongst woody climbers are *Wisteria macrostachya* Nutt., *Smilax laurifolia* L., *S. lanceolata* L. and *Vitis palmata* Vahl. A number of trees are found but they are scarcely so characteristic as the shrubs, since most of them occur also in the low swampy woods of the river bottoms. *Taxodium distichum* Rich., *Planera aquatica* J. F. Gmel., *Carpinus caroliniana* Walt., *Betula nigra* Marsh., *Salix nigra* Marsh., *Liquidambar* *Styraciflua* L., *Acer rubrum* var. *Drummondii* Sarg. and *Fraxinus pennsylvanica* var. *lanceolata* Sarg. are amongst the commonest species. Rank growths of the Cinnamon and Flowering Ferns, *Woodwardia areolata* Moore, *Asplenium Filix-femina* Bernh. and several others, besides Orchids, Sundews and other rare and interesting small plants flourish in such situations. These spring-fed bogs in turn are the sources of or tributary to small creeks, the shady but well-drained bottom lands of which support a varied forest flora. In addition to many of the species mentioned previously as occurring in the bogs and low woods, several appear to be most at home in such locations. Amongst these are *Aralia spinosa* L., *Benzoin aestivale* Nees, *Symplocos tinctoria* L'Her., *Acer floridanum* Pax, *Tilia caroliniana* Mill., *T. caroliniana* var. *rhoophila* Sarg., *Ilex opaca* Ait., and *Vitis rotundifolia* Michx.

As the soil of these little valleys is of high fertility, at least for a few seasons after it has been cleared for agriculture, but few examples of this composition of the forest remain. Indeed throughout the whole region about Fulton the work of clearing and destroying the forest is going on with great rapidity, and in the portions that remain most of the finest specimens of trees valuable for lumber have been culled out. Within the last few years many of the small swamps and bogs have been drained and through the construction of levees and ditches a great deal of bottom land has been added to the cultivated area. From one to three saw logs are usually obtained from the largest trees of Pine, Cypress or Oak, and the remainder is left to decay where felled. When the land is to be brought into cultivation the general practice is to clear out the smaller growth and dispose of this and the dead tree tops by fire, to then deaden the remaining large trees and leave them to slow decay while crops are laboriously cultivated amongst them. Even more distressing to the forest lover and the botanist is the sight of the wholesale destruction of Ash and Hickory on the uplands in search for 'handle material, the trees often yielding only one or two short cuts suitable for this purpose, or to see such interesting trees as *Quercus Durandii* or *Q. arkansana* felled to obtain a single railroad tie. Much of the uplands that are now being cleared are also of very slight value for agricultural purposes, some of them being too sterile and ill drained and others in the sand hill section being subject to rapid destructive erosion as soon as the protecting forest cover has been removed.

Of the following list of woody plants nearly all have been noted or collected by the writer in the Fulton region. In a few cases species have been included on the evidence of herbarium specimens preserved at the Arnold Arboretum, chiefly collected by Mr. B. F. Bush, who visited the locality several times and made extensive collections there. Some omissions doubtless occur, as no attempt was made while in the field to compile a list for the entire region.

#### PINACEAE

*Pinus taeda* L. Often common in flat upland woods, but usually growing in mixed stands with Hickories, Oaks and other broad-leaved trees.

*Pinus echinata* Mill. Growing in similar situations as the last species but less common.

*Juniperus virginiana* L. Nowhere very abundant but most frequent on clay slopes and barrens along the escarpment; sometimes also found in low woods and on banks of ravines in the sand hills.

*Taxodium distichum* (L.) Rich. One of the largest and most striking trees, growing in swamps and along the margins of lakes and bayous.

#### GRAMINAE

*Arundinaria macrosperrma* Michx. A common shrub of the lowlands and along the margins of sandy bogs. Extensive cane-breaks, however, are not developed in this section and the canes seldom exceed two or three meters in height and three or four centimeters in diameter.

#### PALMAE

*Sabal minor* (Jacq.) Pers. Often common and growing in large patches in the low swampy woods and also sometimes found in bogs in the sand hills section.

#### LILIACEAE

*Smilax rotundifolia* L. Low woods and thickets; often abundant.

*Smilax glauca* Walt. Common in low swampy woods and sandy bogs.

*Smilax bona-nox* L. Abundant in dry thickets and clay barrens; also growing in low fields and along railroads.

*Smilax lanceolata* L. A tall growing species found in rich sandy woods and bogs.

*Smilax laurifolia* L. Growing in similar situations to the last and of like habit.

#### JUGLANDACEAE

*Juglans nigra* L. Sometimes growing to a good size in well drained upland woods, but nowhere very common.

*Carya pecan* Engl. & Graeb. Not uncommon on river banks and in low woods.

*Carya cordiformis* (Wang.) K. Koch. A rather abundant species in low woods where it grows to a large size, trees 30 to 35 meters in height and

one meter or more in diameter being sometimes met with. It is also found on bluffs and banks of small streams where it is usually much smaller.

*Carya cordiformis* var. *latifolia* Sarg. The broad leaved form of the Pignut is sometimes found on bluffs and in upland woods.

*Carya myristicaeformis* (Michx. f.) Nutt. This comparatively rare Hickory, with its curious nutmeg-like fruit, is perhaps more abundant in the Fulton region than anywhere else. It is found both in low woods and in the flat uplands. It has pale scaly bark and often becomes a fine tree up to 30 or 35 meters tall.

*Carya aquatica* (Michx. f.) Nutt. A large tree common in low swampy woods. The bark is usually very shaggy and the wood is said to be of inferior value to that of the other Hickories.

*Carya ovalis* var. *obcordata* Sarg. This form of the small fruited Hickory or Pignut, as it is often called in the north, is occasionally found on bluffs or in flat upland woods, and it probably reaches about its southwestern limit here.

*Carya alba* (L.) K. Koch. Common in flat upland woods and on gravelly ridges.

*Carya ovata* (Mill.) K. Koch. Found occasionally in flat upland woods, but not very common.

*Carya Buckleyi* var. *arkansana* Sarg. This is the commonest Hickory of the region, and it often forms a large percentage of the woods on flat uplands. It is also sometimes found in the low woods, on the sand hills and in almost all situations except in the permanent swamps. It becomes a medium sized tree up to 20 or 25 meters in height. The wood is valuable and is much sought, with that of other Hickories, for handles and wagon timber. The bark is rather thick and ridgy but not scaly. The fruit is edible but the kernel is closely compressed in a thick shell; it varies greatly in size and shape.

*Carya Buckleyi* var. *arkansana* f. *pachylemma* Sarg. The type tree of this form was found growing on a bench between the uplands and low bottoms a short distance from Fulton. Although the nut itself is not as large as in some forms of *C. laciniosa* the very thick involucrum makes it perhaps the largest-fruited of the Hickories.

#### MYRICACEAE

*Myrica cerifera* L. Growing in low sandy woods and margins of bogs.

#### SALICACEAE

*Salix nigra* Marsh. Often very common in low woods and along streams.

*Salix nigra* var. *altissima* Sarg. Large specimens of the tall Black Willow are common on the banks of Red River and in the low woods.

*Salix longifolia* Muhl. Growing along bayous and banks of streams.

*Populus balsamifera* var. *virginiana* (Henry) Sarg. Some very large specimens of this Cottonwood are found on the banks of Red River, and it is also often common in low woods.

## BETULACEAE

*Carpinus caroliniana* Walt. Frequent in low woods and along margins of swamps.

*Ostrya virginiana* (Mill.) K. Koch. A common small tree of upland woods.

*Betula nigra* Marsh. Frequent on banks of streams and margins of bogs and lakes.

*Alnus rugosa* (DuRoi) K. Koch. Common in sandy bogs and along small streams in the sandy area.

## FAGACEAE

*Castanea alnifolia* Nutt. Occasionally found in sandy woods and along bluffs and hillsides in the sand hills section.

*Quercus alba* L. A common Oak, of which many fine specimens occur in upland woods.

*Quercus alba* var. *latiloba* Sarg. Trees with leaves having broad shallow lobes are sometimes found growing with the typical form. Extreme specimens look distinct but there is a complete gradation between them.

*Quercus Durandii* Buckley. This species is also popularly known as White Oak, and in bark and wood resembles *Quercus alba*, but in its small irregularly lobed glossy leaves and its extremely small fruit with cups reduced almost to disks, it is very distinct and striking. In eastern Texas, where it is widely distributed but nowhere very common, it grows usually in the better drained portions of low bottoms. Some very fine specimens are found in similar locations near Fulton, but it is even more common on gravelly ridges in the sand hills section. This is apparently the northern limit of its range west of the Mississippi.

*Quercus stellata* Wang. Rather common in upland woods throughout, but most abundant on dry gravelly ridges.

*Quercus macrocarpa* Michx. Not rare and growing to a large size in low woods.

*Quercus lyrata* Walt. A common species of low and swampy woods, growing in wetter situations than any other Oak except *Quercus nigra*.

*Quercus Muhlenbergii* Engelm. On bluffs and hillsides in the uplands, but nowhere common.

*Quercus phellos* L. The Willow Oak is one of the commonest species in low woods, and it is often also abundant in flat poorly drained uplands. Fine large specimens are frequent.

*Quercus nigra* L. A common species of the low bottoms.

*Quercus marilandica* Muench. Sometimes frequent in upland woods; most abundant on gravelly ridges and eroded hillsides.

*Quercus arkansana* Sarg. Confined to the sand hills sections where it is locally frequent on the banks of small streams and on slopes and ridges.

*Quercus rubra* L. This species, the Spanish Oak of the books and the *Quercus falcata* Michx., is commonly called Red Oak in the South. It is one of the commonest species in the Fulton region, being found both in

low woods and on the flat uplands. In the latter environment it often forms a large percentage of the forest. Some magnificent specimens occur, attaining a height of 35 meters or more, a trunk diameter of nearly 2 meters and with a wide spread of branches in more open situations.

*Quercus Shumardii* Buckley. Commonest in flat upland woods and on banks of streams. A fine handsome species, distinguishable from the variety *Schneckii* by the broad flat, often tubercled cups of its fruit, which in size and shape resembles that of the northern Red Oak. There is often also a marked difference in the leaves of the upper and lower branches, the former being deeply incised and the latter having shallow open sinuses.

*Quercus Shumardii* var. *Schneckii* (Brit.) Sarg. Often frequent in upland woods; preferring banks and well drained soils. This is a handsome Oak, sometimes attaining a height of more than forty meters and a trunk diameter of more than a meter. The trunk, usually rising from a well buttressed base, is typically straight and free from branches for a considerable height.

*Quercus velutina* Lam. This species is rather common in places in upland woods.

*Quercus velutina* var. *missouriensis* Sarg. Common with the last.

× *Quercus subfalcata* Trel. Several individuals of this interesting hybrid between *Quercus phellos* and *Q. rubra* have been found in the flat upland woods in the vicinity of Fulton and McNab.

*Quercus nigra* × *Shumardii*. A supposed hybrid between these two species has been found on the banks of a small creek a few miles from McNab. The tree is of adult size, perhaps 10 meters in height, but fruit has not yet been collected from it. It is growing in close proximity to the supposed parents.

*Quercus Durandii* × *stellata*. A single individual, apparently a hybrid between these two species, is growing on the top of a bluff near McNab, as described in a former paragraph of this article.

#### ULMACEAE

*Ulmus americana* L. An abundant species in upland woods.

*Ulmus alata* Michx. Commoner than the last and more widely distributed; often growing in low flat woods as well as on uplands.

*Ulmus crassifolia* Nutt. The commonest Elm of low swampy woods, but also found on flat poorly drained lands of the Lafayette formation.

*Ulmus fulva* Michx. Rather uncommon and confined to banks and bluffs of the sand hills section.

*Ulmus serotina* Sarg. This rather rare, or at least little known, southern Elm has recently been found in low sandy woods near McNab.

*Celtis laevigata* Willd. Common and growing to a large size in low swampy woods, and also found less abundantly on flat uplands.

*Celtis laevigata* var. *texana* Sarg. This well marked variety is sometimes found in upland woods and along the banks of small streams.

*Planera aquatica* (Walt.) J. F. Gmel. A typical species of the swamps, often growing along the margins of lakes and bayous.

#### MORACEAE

*Morus rubra* L. Not rare in upland woods, especially along the escarpment, and sometimes also found in the lowlands.

*Maclura pomifera* (Raf.) Schneid. Found on dry gravelly ridges and eroded hillsides and occasionally in openings along small streams.

#### LORANTHACEAE

*Phorodendron flavescens* (Pursh) Nutt. The Mistletoe is often common in the lowlands and on the flat uplands. It is found most frequently growing as a parasite on the Elms, but has also been noted on several of the Red Oaks, on *Nyssa sylvatica*, *Gleditsia triacanthos* and *Platanus occidentalis*.

#### ARISTOLOCHIACEAE

*Aristolochia tomentosa* Sims. Growing in low sandy ground along a small creek near McNab.

#### POLYGONACEAE

*Brunnichia cirrhosa* Banks. A common woody vine of the low woods, where it attains a large size, climbing to the tops of the largest trees and forming stems sometimes 6 to 8 centimeters in diameter.

#### ANONACEAE

*Asimina triloba* (L.) Dunal. Growing as a shrub or small tree in rich woods, especially along small creeks in the sand hills section.

#### RANUNCULACEAE

*Clematis crispa* L. This small species is sometimes found in low ground, in thickets and on open banks.

*Clematis Simsii* Sweet. Sometimes found in thickets and open ground in the sand hills section.

*Clematis reticulata* Walt. Apparently rare, this species has been collected along sandy bogs near Columbus.

#### MENISPERMACEAE

*Cocculus carolinus* (L.) DC. Sometimes common in thickets and barrens and on open banks.

#### LAURACEAE

*Sassafras officinale* Nees. & Eberm. A small tree of upland woods and thickets.

*Benzoin aestivale* (L.) Nees. Rich woods and margins of bogs in the sand hills section; occasionally also found in low woods in the river valley.

#### SAXIFRAGACEAE

*Itea virginica* L. Confined to bogs and swamps where it sometimes takes root on decaying stumps and logs.

## HAMAMELIDACEAE

*Hamamelis macrophylla* Pursh. Growing along the banks of small sandy streams where it becomes a small tree or more frequently a tall shrub five or six meters in height.

*Liquidambar Styraciflua* L. One of the largest and commonest of forest trees in the region, sometimes attaining a height of from 30 to 40 meters. It appears to be very adaptable, growing in all sorts of soils and environments from the dry ridges to permanent swamps. In the lowlands and flat upland woods it is often an important constituent of the forest.

## PLATANACEAE

*Platanus occidentalis* L. Growing sometimes to a large size on the banks of rivers and smaller streams, but nowhere very common.

## ROSACEAE

*Malus ioensis* var. *Palmeri* Rehd. A spiny shrub or small tree in thickets and openings along the margins of the uplands.

*Rubus Andrewsianus* Blanchard. Common in openings of low woods, in upland thickets and along the margins of swamps and bogs.

*Rubus trivialis* Michx. Thickets and open woods.

*Rubus rubrisetus* Rydb. Common in low open woods, especially on banks and margins of swamps and bayous.

*Rosa setigera* Michx. The smooth form of the Prairie Rose is found in thickets and open woods, in rather dry situations.

*Rosa setigera* var. *tomentosa* T. & G. This form, differing in the pubescence of the leaves and young branches, is sometimes found in similar situations to the last.

*Rosa carolina* L. This low growing Rose is often found in open sandy woods and in upland thickets. It is the species that long passed under the name of *Rosa humilis* Marsh.

*Rosa texarkana* Rydb. I have not recognized this species in the Fulton area but as the type was collected by Eggert at Texarkana, only a few kilometers beyond our limits, it is doubtless to be looked for here.

*Crataegus apiifolia* Michx. A very common species growing in thickets and open woods both in the lowlands and in the driest situations.

*Crataegus spathulata* Michx. About as abundant as the last named species and growing in similar situations.

*Crataegus trianthophora* Sarg. A low shrubby form of wide distribution that has been found in open sandy woods.

*Crataegus bellica* Sarg. The type of this species was collected near Fulton, where it is common in thickets along the escarpment and in openings of upland woods. It has since been recognized at other stations in eastern Arkansas, Texas, Oklahoma and southern Missouri. It is a shrub with remarkably spiny, intricate, zig-zag branches.

*Crataegus Bushii* Sarg. A small tree, belonging like the last to the Crus-galli group. The type locality was Fulton. It is now known also from several stations in western Louisiana, eastern Texas and Oklahoma.

*Crataegus palliata* Sarg. This small tree also belongs to the Crus-galli group, and type was collected at Fulton. It grows in fertile open woods and on rich hillsides.

*Crataegus triumphalis* Sarg. A small tree of the Crus-galli group, growing in open upland woods. The type locality is Fulton.

*Crataegus sordida* Sarg. This is a small tree of the Punctatae group originally described from southern Missouri. Two trees have been found near Fulton, growing in a thicket on the edge of the upland woods, which perhaps belong to this species.

*Crataegus fastosa* Sarg. A small tree of the Punctatae group growing in low woods. The type locality is Fulton.

*Crataegus amicalis* Sarg. A species originally described from Fulton, belonging to the Virides group. It is a small tree growing in open upland woods.

*Crataegus micrantha* Sarg. A small slender tree of the Virides group, growing in low woods near Fulton, from which locality it was originally described.

*Crataegus blanda* Sarg. A small round-topped tree of the Virides group rather abundant in upland woods and on gravelly ridges in the Fulton region. It differs from most of the other species of this group in its rather thick dark bark. This species has also been found in Alabama, Louisiana and Texas.

*Crataegus velutina* Sarg. This species closely resembles *C. viridis* L. except in its more or less densely pubescent leaves, branchlets and inflorescence. It is rather common about Fulton which is the type locality and it has also been found in eastern Texas.

*Crataegus enucleata* Sarg. A small tree of upland woods. Type material of this species was collected at Fulton. It belongs to the Virides group.

*Crataegus lacera* Sarg. A slender tree growing in rich soil in open situations. It is one of the most interesting species described from the Fulton region, being very distinct in characters and of dubious affinities. It was doubtfully referred to the Tenuifoliae group by Professor Sargent, but it differs markedly from other members of that section, which has no other representative known west of the Mississippi River. It may represent a distinct group of this large genus.

*Crataegus viridis* L. A very common species growing both in low woods and in the flat uplands. It is one of the largest of all the Haws, sometimes becoming a tree 10 meters or more in height.

*Crataegus induta* Sarg. This is a small tree of the Molles group growing in upland woods near Fulton, which is the type locality.

*Crataegus invisa* Sarg. This species, also belonging to the Molles group, is rather abundant in rich low woods throughout the Fulton region, where it was first found. It has also been collected at San Augustine, in eastern Texas.

*Crataegus limaria* Sarg. A medium sized tree of the Molles group, of which Fulton is the type station. It is also found in Oklahoma and has a wide range in Texas, extending to the southwestern part of the state and also into Mexico.

*Crataegus brachyphylla* Sarg. This recently described species is one of the comparatively rare and local plants of the gravelly ridges and sand hills near McNab. It is a small tree, growing usually in thickets or open hillside woods, and is very distinct from most of the other species of the group.

× *Crataegus notha* Sarg. This interesting plant, supposed to be a hybrid between *C. apiifolia* and *C. brachyphylla*, is growing sparingly on gravel-capped ridges and sandy slopes near McNab. It is a small tree sometimes shrubby in habit, with thin flaky bark, resembling that of *C. apiifolia*. In leaves, flowers and fruit it is quite intermediate between the two supposed parent species, both of which are growing in close proximity to it.

*Prunus serotina* Ehrh. Not uncommon in upland woods, usually growing on hillsides or in well drained ground.

*Prunus angustifolia* var. *varians* Wight. Extensive thickets of this shrubby Plum are sometimes found on gravelly hillsides and semi-barrens along the escarpment. It usually grows to a height of from one to two meters and is a free bearer. The fruit is of fair quality and there is both a yellow and red form.

*Prunus Munsoniana* Wight & Hedrick. Sometimes found in thickets and open woods along the margins of the uplands.

*Prunus mexicana* Wats. This species is quite common in open upland woods and also sometimes grows in the bottoms. It becomes a large tree for the genus, some specimens measuring ten meters in height with a trunk diameter of three decimeters. It usually bears freely but the fruit is of inferior quality and badly infested with weevil.

*Prunus mexicana* var. *polyandra* Sarg. Occasionally found in fertile soil, growing in open woods.

*Prunus mexicana* var. *fultonensis* Sarg. This rather distinct variety is not uncommon in the sand hills section near McNab, from which locality the type specimens came.

*Prunus umbellata* Ell. A small tree sometimes found in the sand hills section.

*Prunus umbellata* var. *tarda* (Sarg.) Wight. Found in open woods and on slopes in the sand hills section.

#### LEGUMINOSAE

*Cercis canadensis* L. Frequent in open woods and thickets, especially on hillsides in the sandy section.

*Gleditsia triacanthos* L. Found throughout in upland woods and sometimes in the bottoms, but nowhere very common.

*Gleditsia aquatica* Marsh. A common and characteristic species of the

low swampy woods, perhaps being more abundant here than anywhere else in its range.

*Robinia Pseudoacacia* L. Found in thickets along the escarpment and on bluffs and ridges near McNab, where it is certainly native.

*Sophora affinis* T. & G. This interesting southern tree is growing sparingly along gravelly ridges above the sandstone in the hills near McNab. The trees flower and fruit freely and some of them attain nearly the maximum size for the species.

*Amorpha fruticosa* L. Growing in open situations in low woods and along the margins of swamps and bogs.

*Amorpha paniculata* T. & G. A species of eastern Texas that has been found growing in sandy bogs near McNab. ,

*Wisteria macrostachya* Nutt. A high climbing vine of sandy bogs and low sandy woods.

*Acacia angustissima* (Mill.) Ktze. This little shrub, of which the base only is usually woody, has been found in thickets and barrens.

#### RUTACEAE

*Zanthoxylum Clava-Herculis* L. Rather infrequent in thickets and open woods, on eroded hillsides along the escarpment and in the sand hills.

*Ptelea trifoliata* L. Thickets and open hillsides along the escarpment.

#### ANACARDIACEAE

*Rhus Toxicodendron* L. Common everywhere in woods and thickets.

*Rhus quercifolia* (Michx.) Steud. A low shrub, usually not more than half a meter tall, growing in sandy soil of the Cretaceous area.

*Rhus glabra* L. Occasionally found in thickets and open woods.

*Rhus copallina* L. On the bluff at McNab and sometimes found elsewhere in flat open woods.

#### AQUIFOLIACEAE

*Ilex opaca* Ait. Sandy woods and banks of small streams in the Cretaceous area.

*Ilex decidua* Walt. A common species, sometimes becoming a small tree, growing in low woods and also in openings and thickets in the uplands.

*Ilex caroliniana* (Walt.) Trel. This species has been found growing along the north side of the bluff at McNab.

#### CELASTRACEAE

*Evonymus atropurpureus* Jacq. Rarely found in open woods and thickets in the uplands.

*Evonymus americana* L. On moist sandy banks and in woods along small creeks in the Cretaceous area.

#### ACERACEAE

*Acer saccharum* var. *glaucum* Sarg. A common tree in the sand hills section, especially on hillsides and along small streams.

*Acer floridanum* Pax. Abundant in low sandy woods in the Cretaceous area.

*Acer rubrum* L. Common in low woods and less frequent in the uplands of the sand hills section.

*Acer rubrum* var. *tridens* Wood. On bluffs and ridges in the sand hills section.

*Acer rubrum* var. *Drummondii* (H. & A.) Sarg. Common in swampy woods and bogs.

*Acer Negundo* L. Common in low woods and along streams.

*Acer Negundo* var. *texanum* Pax. Growing in similar situations to the last and somewhat more common.

*Acer Negundo* var. *texanum* f. *latifolium* Sarg. This is a common form, growing with the last.

#### HIPPOCASTANACEAE

*Aesculus glabra* var. *leucodermis* Sarg. Usually a shrub two or three meters in height; it is found on hillsides and along small streams in the Cretaceous area.

*Aesculus glabra* var. *micrantha* Sarg. A low shrub, of which the type was collected in this vicinity.

*Aesculus discolor* var. *mollis* Sarg. This red-flowered species is often abundant on hillsides and along small streams in the sand hills.

× *Aesculus Bushii* Schneid. A supposed hybrid between *Ae. glabra* var. *leucodermis* and *Ae. discolor* var. *mollis*, of which the type specimens were collected by B. F. Bush, near McNab.

#### SAPINDACEAE

*Sapindus Drummondii* H. & A. Rather rare in low woods and on gravelly ridges.

#### RHAMNACEAE

*Rhamnus caroliniana* Walt. Often abundant in thickets and on gravelly ridges, and sometimes also found in low woods.

*Ceanothus americanus* L. A low shrub of sandy woods and thickets.

*Berchemia scandens* (Hill) Trel. Common in thickets, barrens and along the borders of upland woods.

#### VITACEAE

*Vitis cinerea* Engelm. Often common in low woods and thickets.

*Vitis cordifolia* Michx. Rather common in low woods and also found in thickets and along small streams in the uplands.

*Vitis palmata* Vahl. Grows along the margins of sandy bogs and on banks of small streams.

*Vitis Linsecomii* var. *glaucia* Munson. A species found in sandy upland woods and on the banks of small streams.

*Ampelopsis cordata* Michx. Growing in thickets and along small streams.

*Ampelopsis arborea* (L.) Koehne. Common in thickets and in open situations both in the lowland and upland woods.

*Parthenocissus quinquefolia* (L.) Planch. Rather frequent in woods and thickets throughout.

*Parthenocissus quinquefolia* var. *Saint-Paulii* (Graeb.) Rehd. A high climber on trees in the low woods.

#### TILIACEAE

*Tilia nuda* Sarg. A large tree of the low woods.

*Tilia floridana* Small. This is the commonest Linden in the Fulton region, growing in low woods and also along hillsides in the sand hills section.

*Tilia caroliniana* Mill. Growing in sandy woods, especially along small creeks.

*Tilia caroliniana* var. *rhoophila* Sarg. A southern species that apparently reaches its northern limit of range here. It grows usually in moist sandy woods.

#### GUTTIFERAE

*Hypericum prolificum* L. Not uncommon in thickets and sandy woods.

*Ascyrum multicaule* Michx. An erect slender shrub, up to nearly one meter in height, growing in low sandy woods.

*Ascyrum stans* Michx. Uncommon in low sandy woods and on moist banks.

#### ARALIACEAE

*Aralia spinosa* L. Occasionally found in low sandy woods and along borders of bogs.

#### CORNACEAE

*Cornus florida* L. Commonly growing in open upland woods, especially in the sand hills section.

*Cornus asperifolia* Michx. Growing both in openings in low woods and in thickets and borders of the upland woods.

*Cornus racemosa* Lam. Bluffs and hillsides, especially in the sand hills section.

*Cornus stricta* Lam. This species is confined to the low wet woods, swamps and bogs.

#### NYSSACEAE

*Nyssa sylvatica* Marsh. A common and widely distributed tree, being found sometimes in the low woods, but more common in the flat uplands and in the sand hills section.

#### ERICACEAE

*Vaccinium arboreum* Marsh. A common small tree, or sometimes a shrub, in the flat upland woods, and also in the sand hills.

*Vaccinium arboreum* var. *glaucescens* (Small) Sarg. Growing usually on bluffs or hillsides in the sand hills section.

*Vaccinium virgatum* Ait. A slender shrub found on moist sandy banks and in low sandy woods.

*Vaccinium vacillans* Kalm. This species usually grows in dryer situations than the last. It is often common in the sandy woods.

*Vaccinium corymbosum* L. A species confined to the sandy bogs and wet sandy woods. It is a shrub, often growing with a single tree-like stem, up to a height of two or three meters.

*Lyonia ligustrina* (L.) DC. This shrub is confined to the low sandy woods and sandy bogs.

*Rhododendron oblongifolium* (Small) Millais. This pretty flowering shrub of the southern states is local and rather rare in sandy bogs near McNab.

#### SAPOTACEAE

*Bumelia lanuginosa* (Michx.) Pers. A common small tree, sometimes found in the low woods, but more abundant in the uplands and especially in the sand hills section.

#### EBENACEAE

*Diospyros virginiana* L. A not uncommon species, growing both in the lowlands and flat open woods. It is most abundant in thickets and opening along the borders of the uplands. So far as I have observed the larger fruited form (var. *platycarpa* Sarg.) does not grow here.

#### STYRACEAE

*Styrax americana* Lam. Growing in low swampy woods and in sandy bogs.

#### SYMPLOCACEAE

*Symplocos tinctoria* (L.) L'Hér. A small slender tree, growing in low sandy woods and on the borders of bogs near McNab.

#### OLEACEAE

*Fraxinus americana* L. A common forest tree, growing sometimes in low woods, but most abundant in the flat uplands. It also is found on bluffs and ridges in the sand hills section.

*Fraxinus pennsylvanica* var. *lanceolata* (Borkh.) Sarg. A common tree, sometimes growing to a large size, in low woods and along the margins of swamps and bogs.

*Fraxinus quadrangulata* Michx. This species is apparently rare and has been noted only on bluffs with northern exposure near McNab.

*Forestiera acuminata* Poir. A common shrub in low woods, swamps and bogs.

*Forestiera acuminata* var. *vestita*, var. nov. Varying from the type in having the leaves, petioles and young branchlets more or less densely clothed with straight short pubescence, which is persistent to the end of the season and even in some cases is found on the slender branchlets of the second season; on the typical form there is only sometimes a slight trace of pubescens on the petioles and veins of the young leaves. A specimen collected by B. F. Bush, No. 2468, Miller County,

Arkansas, April 27, 1905, and distributed as *Adelia pubescens* (Nutt.) Ktze., may be taken as the type of this variety. Mr. Bush's specimens were in flower and young leaf. The pubescent variety is also represented by the following additional specimens in the Arnold Arboretum Herbarium:

ARKANSAS. Van Buren, Crawford County, *E. J. Palmer*, No. 21008, April 29, 1922, with young fruit; Fulton, Hempstead County, *B. F. Bush*, no. 5458, April 5, 1909, with flowers, young leaves and pubescent old branchlets; Miller County (opposite Fulton), *E. J. Palmer*, No. 22268, October 11, 1922, with old leaves densely pubescent beneath, and pubescent branchlets.

LOUISIANA. Richland, Rapides Parish, *R. S. Cocks*, No. 19, June, 1908.

#### APOCYNACEAE

*Trachelospermum difforme* (Walt.) A Gray. Low woods, thickets and borders of bogs.

#### VERBENACEAE

*Callicarpa americana* L. A rather common shrub found sometimes in openings of low woods, but more abundant in the uplands and sandy section.

#### BIGNONIACEAE

*Catalpa speciosa* Engelm. Several small specimens of this species were seen along a small sandy creek near McNab, but I am inclined to think it is a recent introduction here from cultivated trees.

*Campsis radicans* (L.) Seem. Growing along small streams in the sandy section and sometimes along open banks throughout.

*Bignonia capreolata* L. A high climbing vine, not uncommon in woods.

#### RUBIACEAE

*Cephaelanthus occidentalis* L. Very common in opening of low woods and in swamps and bogs.

*Cephaelanthus occidentalis* var. *pubescens* Raf. The pubescent form is sometimes found along sandy streams and in sandy bogs.

#### CAPRIFOLIACEAE

*Viburnum rufidulum* Raf. A common small tree growing both in bottoms and uplands, but most abundant in thickets and openings along the escarpment.

*Symporicarpos orbiculatus* Moench. Sometimes found in thickets and openings in woods, but not very common.

*Lonicera sempervirens* L. Found in thickets along small streams, especially in the sand hills section. Some of the specimens collected here have rather narrow oblong leaves, finely pubescent beneath, and small flowers, and may represent a distinct variety.

*Sambucus canadensis* L. Often common in open woods in the bottoms and in thickets along small streams.

*Sambucus canadensis* var. *submollis* Rehd. This pubescent form is often abundant along small creeks in the sand-hill sections.

In looking over the above list, comprising nearly two hundred species and varieties of woody plants, and comparing it with similar lists from other parts of the general region, it will readily be seen that the representation of the forest flora is very full in the small area within a radius of about five kilometers of Fulton, which has been described, and that besides a few plants peculiar to the region there are several others both of northern and southern range whose presence is rather surprising here. The locality, it should be remembered, is well within the boundaries of the southern division of the Atlantic forest belt and therefore no such diversity is to be expected as might occur along the boundary of two life zones or sub-regions, such as we begin to encounter a few degrees of longitude farther west.

Among plants having a range to the north and east and which appear to reach about the southwestern limits of their range here may be mentioned *Carya ovalis* var. *obcordata* Sarg., *Malus ioensis* var. *Palmeri* Rehd., *Rosa carolina* L., *Robinia Pseudoacacia* L., *Aesculus glabra* var. *leucodermis* Sarg., *Ceanothus americanus* L. and *Fraxinus quadrangulata* Michx. The Crabapples are extremely rare or entirely absent over most of eastern Texas, and when the genus does reappear in the canyons of the Edwards plateau it is represented by a distinct variety (*Malus ioensis* var. *texana* Rehd.). *Robinia Pseudoacacia* L. is undoubtedly native in the mountainous regions of eastern Oklahoma, being very abundant on the sandstone slopes of some of the hills in the Kiamichi range. That it once extended much farther south and west than its present general range is indicated by its presence in protected situations here, where it is probably making its last stand. In much the same case is *Fraxinus quadrangulata* Michx., which is also essentially a species of rocky hills and mountainous regions. On the other hand are such southern and southwestern trees as *Carya myristiciformis* Nutt., *Quercus Durandii* Buckl., *Sophora affinis* T. & G., *Amorpha paniculata* T. & G., *Tilia caroliniana* var. *rhoophila* Sarg., *Sabal minor* Pers. and *Symplocos tinctoria* L'Hér., which seldom appear so far north, at least west of the Mississippi.

There is another group, to which belong *Quercus arkansana* Sarg., *Prunus umbellata* var. *tarda* Wight, *P. mexicana* var. *polyandra* Sarg., *P. mexicana* var. *fultonensis* Sarg., *Crataegus lacera* Sarg., *C. brachyphylla* Sarg., and in a somewhat different degree such species as *Carya myristiciformis* Nutt. *Ulmus serotina* Sarg., which are so far as now known either local about the Fulton region or of wider distribution crop up only here and there in widely detached localities, and are probably surviving remnants of species once common and widely dispersed. *Quercus arkansana* is a form of considerable scientific interest. As already stated it appears to be more nearly related to *Q. nigra* and *Q. marilandica* than to any other known species, and in some respects it is intermediate between them. Both of these common southern Oaks have been recorded by Professor E. W. Berry as occurring in the Pleistocene of the Atlantic coast, and I have

myself found fruit and leaves of *Quercus nigra* in deposits of the same period near Palestine in eastern Texas. And while the little known *Quercus arkansana* has not as yet been recorded in a fossil state its characters and the circumstances of its distribution suggests the possibility at least that it may be a surviving representative of an ancient form perhaps ancestral to both of its nearest living allies. Somewhat similar is the case with regard to the Nutmeg Hickory (*Carya myristicaeformis* Nutt.), which, as mentioned by Professor Sargent (Botanical Gazette, LXVI, 233), is the only living species connecting two quite distinct sections of the Hickories. Its comparative rarity and peculiar distribution would also indicate that it is an ancient and disappearing species that may formerly have been much more abundant. It is of course quite impossible now to trace except in the most general way the complex succession of influences that resulted in the present composition and distribution of our forests. In their earlier stages they were probably profoundly affected by the advance and retreat of the glaciers, or by oreogenic movements with consequent changes in drainage systems or the obliteration of great inland bodies of water, or by the appearance or severance of land connections or barriers, any of which might result in profound climatic changes. In response to these influences the movements of advance or retreat would proceed until they become inoperative or perhaps were reversed by some new development. In the progress of such movements, especially along lines of retreat, many stragglers and small colonies would be scattered and make stands in spots particularly favored by topography, soil or other local conditions, and as the turning point was approached these would naturally have become more numerous. In the course of such fluctuations cross currents must often have met and so brought together diverse elements from widely separated sources.

In localities like the one we are considering, in the Red River valley near Fulton, Arkansas, there seems to be evidence that something of this sort has taken place. Indeed such shifting and minglings have doubtless occurred many times in all parts of the forest area, the only difference being that in certain places the effect was more marked and the evidence has been better preserved. Among the influences that we may recognize at present as accounting for the richness and diversity of the flora and the preservation of a number of unusual species in this locality are the proximity of the great river and the character and position of its valley, lying as it does just south of the semi-mountainous Ozark region; the diversity of drainage conditions and soils, and especially the presence of the light marly sands and the rather peculiar ridge and ravine topography developed in this formation. Just what, however, were the influences or sequence of events that account for the bringing together of this rather remarkable collection of ligneous plants in so small a space it is also impossible to determine. In its earlier stages it was doubtless involved with those great

continental movements late in the Tertiary that elevated the western lands and sent down the floods that spread the Lafayette gravels across the Gulf States from the base of the Rocky Mountains to the Mississippi River, that elevated the Ozark plateau and Boston Mountains on the north and drove the waters of the Gulf far to the south before the advancing plain. At any rate it seems evident that in places like this we may recognize the approximate lines along which some of these fluctuations of the ancient forest culminated. So that the investigator here may feel an emotion somewhat like that of a traveller standing on some famous historic spot which brings him face to face with the past. Only here he may be sure he is dealing with events that far transcend the dates of all human history, and the silent forest yet stands as a living link between the present and the past.

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THE RHODODENDRONS OF NORTHEASTERN ASIA  
EXCLUSIVE OF THOSE BELONGING TO THE  
SUBGENUS ANTHODENDRON

ERNEST H. WILSON

THE Rhododendrons dealt with here are found scattered over an immense territory from the Altai Mountains in about Long. 90° E. eastward to the Pacific Ocean in Long. 145° E.; in latitude from about 60° N. to 30° N. One species (*R. kamtschaticum* Pall.) extends through the Aleutian Islands to Alaska and finds the southern limit of its distribution on Banks Island in British Columbia. Three of the species (*R. Metternichii* S. & Z., *R. Keiskei* Miq. and *R. semibarbatum* Maxim.) are purely Japanese. One (*R. brachycarpum* D. Don) is Japanese and Korean; another (*R. micranthum* Turcz.) extends from Korea through south Manchuria, south Mongolia and northern to western China and has its southern limit of distribution on the mountains of Hupeh province and its western on that of Szech'uan on the Chino-Thibetan border-land. The other species are very wide-spread in northeastern Asia though *R. Adamsii* Rehd. seems to be limited to east-central Siberia and more especially to the mountains of the Baikal region and the valley of the Lena River. One might expect to find a greater number of species in so vast a territory but it should be remembered that as a rule in boreal regions species are few and widely distributed. In Japan especially one would have thought that a more intimate knowledge of the rich flora would have revealed additional species of Rhododendron than were known to Maximowicz in 1870. It is true that Japanese botanists have described one or two species but I do not think these can be maintained.

In his work on the Rhododendrons of eastern Asia, Maximowicz enumerates 31 species indigenous in that region. Of these 17 species are what are popularly known as Azaleas and have been described by

Wilson & Rehder in their Monograph of Azaleas. Of the remaining species China claims three (*R. Fortunei* Lindl., *R. Championae* Hook. and *R. ovatum* Planch.) and the others are distributed through the territory dealt with in this article. Three species only were known from China in 1870, whereas today they run into hundreds. On the contrary there have been no additions to the number known to Maximowicz from Japan and continental northeastern Asia.

The Rhododendrons of northeastern Asia have in general been known since a very long time and at least three species were known in Linnaeus' time. Yet they have been slow in reaching the gardens of the west and except *R. dauricum* Linn. and *R. micranthum* Turcz. have not yet found a proper foot-hold in cultivation. They are all quite as hardy here as *R. catawbiense* Michx. but like many other plants from high northern regions, they are difficult to grow. Several of them fall victims nearly every year to destructive spring frosts whilst in the case of others the right conditions are hard to find. In England where choice among many species and a plethora of hybrids obtains it is doubtful if the Rhododendrons of northeastern Asia will ever be considered of much general importance in gardens. In eastern North America where the climate is more severe it is different. For this part of the world *R. brachycarpum* D. Don and *R. Metternichii* S. & Z. are most valuable plants and in the future will probably play a highly important part in the evolution by hybridization of a race of Rhododendrons suitable to the extreme climatic conditions which obtain here. *R. dauricum* Linn., especially its var. *mucronulatum* Maxim., is one of our best spring-flowering Rhododendrons and *R. micranthum* Turcz. has the distinction of being the only species known from China that is hardy in the Arnold Arboretum.

#### KEY TO THE SUBGENERA

Shrubs or trees with persistent, rarely deciduous, glabrous, lepidote or tomentose leaves; stamens 5-20; ovary glabrous, lepidote or tomentose, never setose, sometimes more than 5-celled; corolla 5, 7 or 9-lobed.... I. *Eurhododendron*.

Shrubs with deciduous, non-lepidote leaves; corolla rotate to sub-rotate; stamens 5; flowers solitary, rarely 2, from lateral, clustered buds.....II. *Azaleastrum*.

Shrublets with deciduous, non-lepidote leaves; corolla rotate; stamens 10, flowers 1 or racemously 2 or more from a terminal bud; bracts foliaceous.

III. *Therorhodion*.

#### SUBGEN. I. EURHODODENDRON ENDL.

*Rhododendron* subgen. *Eurhododendron* Endlicher, Gen. Pl. 759 (1839), emended.

*Rhododendron* sect. I *Ponticum* G. Don, Gen. Syst. III. 843 (1834), including sections II, III and IV.

*Rhododendron* sect. III *Eurhododendron* De Candolle, Prodr. VII. 721 (1839), including sections I, II, and IV.

## KEY TO THE SECTIONS

- Leaves persistent, glabrous or tomentose beneath, never lepidote; ovary glabrous, glandular or tomentose, never scaly; stamens 10 to 20; flowers several from a terminal bud..... 1. *Leiorhodium*  
 Leaves persistent, more or less clothed with lepidote glands; corolla rotate, campanulate or funnel-form; stamens 10; ovary lepidote; flowers several from a terminal bud..... 2. *Lepidophyllum*  
 Leaves persistent, more or less lepidote; corolla salver-shaped, with cylindric tube and spreading limb, villose within the tube; stamens 5–10; ovary densely lepidote, 5-celled; flowers several from a terminal bud..... 3. *Pogonanthum*  
 Leaves usually deciduous, lepidote; corolla campanulate; stamens 10; flowers solitary from lateral, clustered buds..... 4. *Rhodorastrum*

## SECT. 2. LEIORHODIUM REHD.

**Rhododendron** sect. *Leiorhodium* Rehder in Bailey, Stand. Cycl. Hort. v. 2937 (1916).

*Rhododendron* sect. *Eurhododendron* Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, xvi. no. 9, 14 (Rhod. As. Or.) (1870), not Endlicher.

## KEY TO THE SPECIES

- Bud-scales deciduous; flowers pale- to rose-pink. Leaves covered with felt-like tomentum on the under side.  
 Leaves narrowed at base; corolla 5- to 7-lobed ..... 1. *R. Metternichii*.  
 Leaves rounded or sub-auricled at base; corolla 5-lobed .. 2. *R. brachycarpum*.  
 Bud-scales persistent; flowers pale yellow. Leaves glabrous on the under side.  
     3. *R. chrysanthum*.

**Rhododendron Metternichii** Siebold & Zuccarini, Fl. Jap. I. 23, t. 9 (1835); in Abh. Akad. Münch. IV. pt. 3, 6 (Fl. Jap. Fam. Nat. II. 130) (1846).—De Candolle, Prodr. VII. 721 (1839).—Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, xvi. no. 9, 21 (Rhod. As. Or.) (1870).—Franchet & Savatier, Enum. Pl. Jap. I. 287 (1875).—Mangles in Gard. Chron. ser. 2, xviii. 85 (1882).—Nicholson, Dict. Gard. III. 296 (1887).—Shirasawa, Icon. Ess. For. Jap. II. t. 60, figs. 1–13 (1908).—Bean, Trees & Shrubs Brit. Isl. II. 367 (1914).—Rehder in Bailey, Stand. Cycl. Hort. v. 2940 (1916).—Millais, Rhodod. 209 (1917).

*Rhododendron maximum* Thunberg, Fl. Jap. 181 (1784), not Linnaeus.  
*Hymenanthes japonica* Blume, Bijd. Fl. Ned. Ind. '862 (1826).—G. Don, Gen. Syst. III. 849 (1834).

*Rhododendron Metternichii*  $\alpha$ . *heptamerum* Maximowicz in Mem. Acad. Sci. St. Pétersb., sér. 7, xvi. no. 9, 21 (Rhod. As. Or.) (1870).

*Rhododendron Hymenanthes* Makino in Tokyo Bot. Mag. XVI. 33 (1902).—Matsumura, Ind. Pl. Jap. II. pt. 2, 460 (1912).

*Rhododendron Hymenanthes*  $\alpha$ . *heptamerum* Makino in Tokyo Bot. Mag. XVI. 33 (1902).—Matsumura, Ind. Pl. Jap. II. pt. 2, 460 (1912).

*Rhododendron japonicum* Schneider, Ill. Handb. Laubholzk. II. 490, figs. 323 o-p, 324 b-c (1909), not Suringar.

Shrub from 1–4 m. tall, branches stout, numerous. Leaves stoutly petioled, oblong-lanceolate to oblanceolate, 5–12 cm. long, 1.5–4.5 cm. wide, rounded, obtuse or short-cuspidate, base narrowed, rarely rounded, dark lustrous green and glabrous above, densely clothed with floccose to crustaceous gray to rufous-colored tomentum below. Flowers pale to deep

rose-pink, in loose umbellate corymbs, campanulate, 4.5–6.5 cm. across; pedicels slender, 2–4 cm. long, clothed with gray to ferruginous curled hairs; calyx a mere rim with 5 or 7 minute teeth, pubescent; corolla 5- or 7-lobed, lobes rounded, spreading; stamens 10–14, shorter than corolla, filaments puberulous to pubescent in lower half; pistil exceeding stamens, ovary ovoid, densely tomentose with curled red-brown hairs, style glabrous, stigma slightly capitate. Fruit oblong, 1–2 cm. long, furrowed, valves thin, glabrescent; seed brown, oblong, slightly winged.

Habitat. Japan, from Kyushu north through Shikoku and Hondo to Adzuma-san in Uzen province.

This is the common evergreen Rhododendron of Japan and is not known to grow wild outside of that country. It is unknown in Hokkaido and does not occur in extreme northern Hondo. From Adzuma-san on the borders of Uzen and Iwashiro provinces southward it is a common plant being found at lower levels than its relative *R. brachycarpum* D. Don. Through the Nikko region, on Mt. Fuji and on the mountains of Shinano province it is particularly abundant between 3000 and 7000 ft. above sea-level. It grows with miscellaneous forest plants and from the middle of May to end of June, according to latitude, is one of the floral features of the forests. It exhibits quite a range of variation in size of leaf and color of flowers. In the form on which Siebold and Zuccarini based the species the flowers are 7-partite. Matsumura gives the mountains of Kyushu and of Shikoku as the habitat of this plant. I did not see this form in Japan and it is known to me only from a specimen collected round Takeo in Kyushu by Père U. Faurie. This has flowers  $2\frac{1}{2}$  inches across and the indumentum is rust-colored. This Rhododendron is mentioned by Kaempfer (*Amoen. Exot. fasc. v. 877 [1712]*) under the vernacular name of "Seki Nan, vulgo Sáku Nange," and he states that there are two forms one with white and another with smaller reddish flowers. Kaempfer must have seen it in Japanese gardens for it is unlikely that he or any of the writers before Maximowicz saw this plant in a wild state. So far as I can discover this 7-merous form has not been introduced into cultivation in Europe or America. Judging by the solitary example before me it appears to be a finer plant than the variety we have in our gardens.

**Rhododendron Metternichii** var. *pentamerum* Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, xvi. no. 9, 22 (Rhod. As. Or.) (1870).—Bean, Trees & Shrubs, Brit. Isl. II. 367 (1914).

*Rhododendron Hymenanthes* β. *pentamerum* Makino in Tokyo Bot. Mag. XVI. 33 (1902).—Matsumura, Ind. Pl. Jap. II. pt. 2, 460 (1912).

*Rhododendron japonicum* var. *pentamerum* Hutchinson in Bot. Mag. CXXXVII. t. 8403 (1911).

*Rhododendron Nakaii* Komatsu in Matsumura, Pl. Koisikav. I. 145, t. 73 (1913).

This form, which is really typical of the species, is distinguished by its 5-merous flowers which naturally are smaller than those of the 7-merous

type. This is the form that is so widely spread in Japan and such a feature of the woodlands on the mountains of central Hondo as far north as the Nikko region. The scales of the winter-buds are clothed with yellow- to red-brown curled hairs. The leaves vary in size and the tomentum may be light- to rufous-gray and either loose or compact in texture, this being somewhat dependent on age and exposure. The flowers vary considerably in size and in color from pale- to rose-pink. I have a co-type of *R. Nakaii* Komatsu collected on Shirane-san in the Nikko region. It has unusually long petioles and small pale-colored flowers but I do not think it has any claim to a distinct name even as a form.

According to Nicholson *R. Metternichii* was introduced into England in 1870; Mangles writing in the Gardeners' Chronicle, 1882, speaks of it being grown in France and England and tells of receiving the pentamerous form from Luscombe. The story is not very clear and it seems strange that the species should be so little known in England today. Into America, this Rhododendron was first introduced by Professor Sargent who sent seeds from the Nikko region in the autumn of 1892, some of these were sent to England. In the Arnold Arboretum it has grown well and proved perfectly hardy and flowers freely. With *R. brachycarpum* D. Don it promises with us to be the most satisfactory of the broad-leaf evergreen Rhododendrons of eastern Asia. In England where there is such great variety to choose from, these Japanese species may be thought lightly of but in eastern North America they are extremely valuable hardy plants.

**Rhododendron Metternichii var. angustifolium** Bean, Trees & Shrubs Brit. Isl. II. 368 (1914).

*Rhododendron Metternichii* β. *pentamerum* f. *angustifolia* Makino in Tokyo Bot. Mag. x. 212 (1896).

*Rhododendron Hymenanthes* f. *angustifolium* Makino in Tokyo Bot. Mag. xvi. 33 (1902).—Matsumura, Ind. Pl. Jap. II. pt. 2, 460 (1912).

*Rhododendron stenophyllum* Makino in Tokyo Bot. Mag. xxiv. 99 (1910).—Komatsu in Matsumura, Pl. Koisikav. I. 60, t. 35 (1912).

This variety is distinguished by its leaves which are narrower and longer than those of the type. Bean says the branches are stiffly erect and that the plant is quite distinct. It is known to me only from a specimen from the Kew plant which we are told was introduced from Tokyo in 1894. The indumentum is ferruginous. Makino founded this variety on a specimen cultivated in the Botanic Garden, Tokyo, and probably the Kew plant is from the type. Makino states that it is said to grow wild on the mountains of the northern boundaries of Mikawa and Totomi provinces in Hondo.

There is a hybrid which may be named

× **Rhododendron Watereri** Wilson, n. hyb.

*Rhododendron Metternichii* var. *pentamerum* × *catawbiense* hybrid Hort.  
Anthony Waterer.

Young shoots clothed with gray to gray-brown floccose tomentum, early becoming glabrous. Leaves when young covered with short, curled hairs and on the underside with a short dun-colored felt, later becoming glabrescent, sub-acute, base abruptly narrowed. Flowers pale- to deep rose-pink, pedicels floccosely pubescent with occasional short stipitate glands; calyx saucer-shape with 5, short, rounded often glandular-ciliolate teeth; corolla wide funnel-form, 5-lobed, lobes spreading, rounded, sometimes emarginate; filaments pilose in lower half; ovary glabrescent.

This hybrid is fairly intermediate between the species cited as its parents though the glabrescent ovary, the usually glandular calyx and occasional stipitate glands on the pedicels denote the presence of other and foreign influence. The habit of the plant and the character of the young shoots and leaves strongly suggest *R. Metternichii* S. & Z. while the broader leaf-base and glabrescent adult foliage recalls *R. catawbiense* Michx. The flower truss is compact and rounded and the flowers, though not large, are numerous and of pleasing shades of pink. As the type (No. 5905, Arnold Arboretum) I have selected the form with deep rose-pink flowers but the others are equally lovely.

This hybrid was raised by Anthony Waterer at Knap Hill, Surrey, and has been growing in the Arnold Arboretum since 1909. It has proved perfectly hardy and is of vigorous habit and promises to be a most useful Rhododendron for the gardens of New England. The presence of a felt of hairs on the underside of the leaf is a decided advantage to any Rhododendron in New England since it is a protection against the Rhododendron fly which is a troublesome pest in many parts of eastern North America.

**Rhododendron brachycarpum** D. Don apud G. Don, Gen. Syst. III. 843 (1834).—De Candolle, Prodr. VII. 723 (1839).—A. Gray in Mem. Am. Acad. n. s. VI. 400 (Bot. Jap.) (1858–59).—Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 22 (Rhod. As. Or.) (1870).—Franchet & Savatier, Enum. Pl. Jap. I. 288 (1875).—Sargent in Gard. & Forest, I. 292, fig. 46 (1888).—Hookerf. in Bot. Mag. CXXIX. t. 7881 (1903).—Komarov in Act. Hort. Petrop. XXV. 207 (Fl. Mandsh. III.) (1907).—Schneider, Ill. Handb. Laubholzk. II. 493, fig. 326-a (1909).—Nakai in Jour. Coll. Sci. Tokyo, XXXI. 74 (Fl. Kor. II.) (1911); Fl. Sylv. Kor. pt. VIII. 41, t. 14 (1919).—Matsumura, Ind. Pl. Jap. II. pt. 2, 458 (1912).—Bean, Trees & Shrubs Brit. Isl. II. 345 (1914).—Rehder in Bailey, Stand. Cycl. Hort. V. 2940, fig. 3384 (1916).—Millais, Rhodod. 129 (1917).

Bush 0.5–4 m. tall, much-branched, young shoots clothed with gray tomentum. Leaves petioled, elliptic to oblanceolate-oblong, 5–20 cm. long, 2–9 cm. wide, rounded, short-apiculate at apex, base cuneate, truncate or sub-auriculate, dark green, reticulate above, and clothed with a felt of gray to dun-colored, stellate tomentum below, petiole stout, 1–3 cm. long, clad with gray tomentum. Flowers white or yellowish striped and flushed pink with greenish, green or brown honey-guides, about 5 cm.

across, borne in compact, rounded trusses, rachis 1-4 cm. long, pedicels slightly villose; calyx minute, 5-toothed; corolla broad-funnel-form 5-lobed; stamens 10, unequal, included, filaments villose near base, anthers pale, pistil shorter than longest stamens, ovary densely felted with pale brown tomentum, style glabrous, stigma small, slightly lobed. Fruit cylindric, 1.5-2 cm. long, furrowed, glabrescent; seed dark brown, ovoid, surrounded by small wing.

Habitat. Japan, high mountains of Shikoku and Hondo to Hokkaido; Korea, Dagelet Island, and Diamond Mountains.

This handsome species is widely distributed in Japan where I am familiar with it from Shiraga-yama in Tosa province northward to Rubeshibe in north Hokkaido. It is a common undergrowth in the coniferous forests and above the tree limit on the higher mountains of Shinano province, the Nikko region, Mt. Fuji, Adzuma-yama and on other mountains it often forms dense thickets. Its altitudinal range is between 2000 and 8500 ft. The leaves vary considerably in size and those on specimens I collected in Korea and Hokkaido are the broadest I have seen. The flowers vary in degree of whiteness, some being decidedly yellowish, and in the amount of pink. A specimen I collected in Tosa has fruit 2 cm. long and 0.8 cm. wide and leaves 20 cm. long.

This species was first introduced into cultivation by Dr. G. R. Hall who sent a plant from Japan by Mr. G. Gordon Dexter of Boston, in 1861. This was given to Francis Parkman, Jamaica Plain, Mass., in whose garden it grew for a number of years when it was transferred to the Arnold Arboretum. The flowers were straw-colored without any pink. Its introduction into Europe was much later, according to the Botanical Magazine in 1895, while Millais gives 1888. In Massachusetts it has proved a hardy and valuable plant and in spite of the severe winters the foliage does not brown nor do the flower-buds suffer. Its growth is slow and seedlings seem difficult to establish. On account of its great hardiness it is one of the most valuable Rhododendron for New England gardens and it seems strange that the hybridist has not worked on this species. Mr. J. C. Williams of Caerhays in Cornwall, England, has crossed it with *R. campylocarpum* Hook. f. but I do not know the garden value of this hybrid.

The form with rose-pink flowers has been named

**Rhododendron brachycarpum** var. **rosaeflorum** Miyoshi in Jour. Coll. Sci. Tokyo, xxvii. art. 11, 8 (1910).

*Rhododendron brachycarpum* var. *roseum* Koidzumi in Tokyo Bot. Mag. xxx. 77 (1916).

This color-form occurs mixed with the type. Koidzumi records it from the high mountains of Hokkaido. I purchased specimens from a florist in Kyoto and these have larger flowers than is usual in the species, being 6.5 cm. across.

The form with nearly white flowers has been distinguished as *Rhododendron brachycarpum* var. *leucanthum* Koidzumi in Tokyo Bot. Mag. xxviii. (59) (1914), name only.

On Dagelet Island in the Japan Sea and on the Diamond Mountains in Korea I gathered this albino form which seems to be dominant there.

A form with petaloid stamens has been named *Rhododendron brachycarpum* var. *Nemotoanum* Makino in Tokyo Bot. Mag. xxiii. 22 (1909).

*Rhododendron brachycarpum* var. *Nemotoi* Miyoshi in Jour. Coll. Sci. Tokyo, xxvii. art. 11, 8, tt. 1, 2 and 3, figs. 1-4 (1910).

This monstrosity was found growing wild on Adzuma-yama in Iwashiro province, northern Hondo.

*Rhododendron brachycarpum* var. *lutescens* Koidzumi in Tokyo Bot. Mag. xxx. 77 (1916).

*Rhododendron Fauriei* Franchet in Bull. Soc. Phil. 3 (1886).—Matsumura, Ind. Pl. Jap. II. pt. 2, 459 (1912).

*Rhododendron chrysanthum* var. *niko-montanum* Komatsu in Matsumura, Icon. Pl. Koiskav. III. 99, t. 195 (1917).

*Rhododendron niko-montanum* Nakai in Tokyo Bot. Mag. xxxi. 242 (1917).

This variety is distinguished chiefly by the absence of indumentum on the underside of the leaves; the flowers are white to yellowish white with few or no green spots; occasionally the flowers are suffused with pink. It occurs on many of the higher mountains of northern Hondo. Professor Sargent in 1892 and myself in 1914 collected it on Hakkoda-yama in Mutsu province at 5000 ft. altitude where it is abundant. I also gathered it on Adzuma-yama between 4000 and 6000 ft. altitude. I have a specimen collected by Père Faurie (No. 5828) in woods "Ubaya" wherever that is. Komatsu records it from the Nikko mountains and Koidzumi from Mt. Ontake in Shinano province.

This form is in cultivation in the Edinburgh Botanic Garden where I saw it in flower in the summer of 1922. It is an interesting plant but hardly worthy of a distinctive name, anymore than are the color forms whose names are collated above.

*Rhododendron chrysanthum* Pallas, Reise, III. 729, t. N. fig. 1, 2 (1776); Fl. Ross. I. 44, t. 30 (1784); Voyages, IV. 531, t. 31, fig. 1-2 (1793).—Linnaeus, Pfanzensyst. III. 559, t. 24-b (1778); Suppl. 237 (1781).—Zahn, Diss. Inaug. (1784).—Woodville, Med. Bot. III. 403, t. 149 (1793).—Chaumeton, Chamberet & Poiret, Fl. Méd. VI. 47, t. 301 (1818).—Roques, Phytogr. Méd. I. 291, t. 84 (1821).—G. Don, Gen. Syst. III. 843, fig. 141 (1834).—Loudon, Arb. Brit. II. 1135 (1838).—DeCandolle, Prodr. VII. 723 (1839).—Ledebour, Fl. Ross. II. 920 (1846).—Trautvetter & Meyer in Middendorff., Reis. Sib. I. pt. 2, 63 (Fl. Ochot.) (1858).—Burnett, Pl. Utilior. III. no. 65, t. (1847).—Maximowicz in Mém. Acad. Sci. Sav. Etr.

St. Pétersb. ix. 189 (Prim. Fl. Amur.) (1859); in Mém. Acad. Sci. St. Pétersb. sér. 7, xvi. no. 9, 20 (Rhod. As. Or.) (1870).—Fr. Schmidt in Mém. Acad. Sci. St. Pétersb. sér. 7, xii. no. 2, 55 (Reis. im Amur-l.) (1868).—Komarov in Act. Hort. Petrop. xxv. 205 (Fl. Mandsh. III.) (1907).—Schneider, Ill. Handb. Laubholzk. II. 481 (1909).—Nakai in Jour. Coll. Sci. Tokyo, xxxxi. 74 (Fl. Kor. II) (1911); Fl. Sylv. Kor. pt. VIII. 40. t. 13 (1919).—Bean, Trees & Shrubs Brit. Isl. II. 349 (1914).—Matsumura, Ind. Pl. Jap. II. pt. 2, 459 (1912).—Miyabe & Miyake, Fl. Sachal. 310, no. 385 (1915).—Millais, Rhodod. 143 (1917).

*Rhododendron officinale* Salisburi in Hooker, Parad. Londin. II. t. 80 (1807).

Shrub 0.2–1 m. tall, much-branched, bark scaly, branches stout clothed with old persistent bud-scales. Leaves stoutly petioled, coriaceous, glabrous, except for slight pubescence on petiole, shining green, elliptic-to ovate-lanceolate, often broadest above the middle, 2.5–8 cm. long, 1.3–3.5 cm. wide, rounded and mucronulate at apex, narrowed at base, margin slightly recurved, rugulose with impressed veins above. Flowers pale yellow, 5–8, in terminal umbels, wide-campanulate, 2.5–3 cm. across, pedicels rigid, erect, 4–6 cm. long, subtended by persistent bud-scales, clothed with tawny floccose tomentum; calyx pubescent, minute, saucer-shape, with 5 rounded teeth; corolla 5-lobed, lobes spreading, rounded; stamens 10, shorter than corolla, filaments flattened, villose at base; pistil exceeding the stamens, ovary ovoid, furrowed, clothed with ferruginous villose tomentum, style glabrous, curved below the capitate, lobed stigma. Fruit erect, dark brown, ovoid to oblong-ovoid, 0.8–1.4 cm. long, glabrescent, seeds shining brown, winged at each end.

Habitat. Altai mountains eastward through Siberia to Kamtschatka, the Kurile Islands and Saghalien; Japan, Hokkaido southward through Hondo to the high mountains of Shinano province; also in Korea.

This wide-spread species is distinguished by its glabrous rugulose leaves, its umbellate yellow flowers on long erect pedicels and by the long-persistent bud-scales which clothe the shoots. It is most closely related to *R. caucasicum* Pall. but the yellow-flowered form of that species has leaves markedly hairy on the underside and the flower-truss has an elongate rachis. In Hokkaido and north Korea where I have seen *R. chrysanthum* wild it has always been on the upper slopes of volcanic mountains. In Hokkaido within the crater of Shiribeshe-san at about 6000 ft. altitude I gathered it in flower on July 27, 1914, with unmelted snow a few feet away. As I know it the species is a much-branched shrub from a few inches to 3 feet high; often it forms dense low thickets covering large areas on bare mountain slopes. I never saw any variation in color of the flowers and except that it is an alpine plant I see no reason why it should not thrive in our gardens. So far all efforts to grow it in the Arnold Arboretum have failed. Seeds I collected in Hokkaido and Korea germinated freely but after struggling for a while the seedlings all died. In the Proctor Arboretum at Topsfield, Massachusetts, it was

growing in 1918, but personally I have never seen a healthy plant in gardens. Bean comments on its bad behavior in England and that it is not figured in the Botanical Magazine proves it is either a rare plant or difficult to grow in England.

This species has been known for a long time and seems to have been first collected by D. G. Messerschmidt in Russian Dahuria sometime between 1720 and 1727. Very soon after it was observed by Messrs. Gmelin & Steller in the valley of the Lena River and eastward. Gmelin in his Fl. Sib. IV. 121, t. 54 (1769) refers to it as "Andromeda foliis ovatis, utrinque venosis, corollis campanulatis obliquis longissimis." Pallas in his travels in Siberia met with it and very probably it was he who introduced it into Russia. In 1796 it was introduced into England from Russia by Mr. Joseph Busch. Millais (Rhodod. 143) claims that after the introduction in 1803 of *R. caucasicum* Pall. the early hybridisers in Scotland raised numerous hybrids between it and *R. chrysanthum* many of which are now among our most valuable spring Rhododendrons. He mentions (p. 139) *R. caucasicum* var. *stramineum* Hook. and *R. caucasicum* var. *flavidum* Nicholson. I can find no trustworthy evidence in support of this and am of the opinion that *R. chrysanthum* has played no part in the production of the so-called "Caucasicum Hybrids" or, indeed, in the production of any hybrid Rhododendron. The early writers confused *R. chrysanthum* with the yellow-flowered form of *R. caucasicum* Pall. and it is this plant that figures in the Rhododendrons mentioned by Millais.

To the hunters in Siberia *R. chrysanthum* was famous as a medicine. An infusion of the young leaves was considered a cure for rheumatism. It was also recommended in venereal diseases. On this account much was written about it toward the close of the 18th and early in the 19th centuries and it is beautifully figured in several of the works cited, especially Hooker's figure in his *Paradisus Londinensis*.

#### SECT. 2. LEPIPHERUM G. DON.

*Rhododendron* sect. *Lepipherum* G. Don, Gen. Syst. III. 845 (1834).

*Rhododendron* sect. *Osmothamnus* Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, xvi. 9, 14 (Rhod. As. Or.) (1870), in part.

#### KEY TO THE SPECIES

Bud-scales deciduous.

Flowers white; corolla rotate-campanulate; filaments glabrous.

4. *R. micranthum*.

Flowers pale yellow; corolla broad-campanulate; filaments slightly pilose at base..... 5. *R. Keiskei*.

Bud-scales persistent. Flowers rose-purple; corolla wide-campanulate; filaments villose at base..... 6. *R. parvifolium*.

**Rhododendron micranthum** Turczaninow in Bull. Soc. Nat. Mosc. x. no. 7, 155 (1837); in xxii. pt. 2, 502 (Fl. Baical. Dahir.) (1848).—De

Candolle, Prodr. vii. 727 (1839).—Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, xvi. no. 9, 18, t. 4, figs. 1–10 (Rhod. As. Or.) (1870).—Franchet in Nouv. Arch. Mus. Paris, sér. 2, vi. 77 (Pl. David. i. 197) (1883).—Hemsley in Jour. Linn. Soc. xxvi. 27 (1889).—Komarov in Act. Hort. Petrop. xxv. 205 (Fl. Mandsh. III.) (1907).—Chipp in Bot. Mag. cxxxiv. t. 8198 (1908).—Schneider, Ill. Handb. Laubholzk. II. 475, figs. 315 p–q, 316g (1909).—Hemsley & Wilson in Kew Bull. Misc. Inform. 1910, 117.—Pampanini in Nuov. Giorn. Bot. Ital. n. ser. xvii. 683 (1910).—Rehder & Wilson in Sargent, Pl. Wilson. i. 513 (1913).—Bean, Trees & Shrubs Brit. Isl. II. 368 (1914).—Rehder in Bailey, Stand. Cycl. Hort. v. 2938 (1916).—Millais, Rhodod. 210 (1917).—Nakai, Fl. Sylv. Kor. pt. VIII. 30, t. 7 (1919).—Osborn in Garden, lxxxiv, 270, fig. (1920).

*Rhododendron Rosthornii* Diels in Bot. Jahrb. xxix. 509 (1900).

*Rhododendron Pritzelianum* Diels I. c. 510.

A much-branched shrub, 1–2.5 m. tall, with branches rigid, twiggy, lepidote and pubescent; bud-scales lepidote without, ciliolate, caducous. Leaves persistent for one year, scattered, petioled, oblanceolate to lanceolate, 1.5–4 cm. long, 0.5–1.5 cm. wide, acute or obtuse at apex, with a gland-tipped mucro, narrowed at base to the petiole, dark green, finely reticulate, with scattered lepidote glands above, densely covered with pale- to rust-brown lepidote scales below. Flowers white, very numerous, 0.8–1 cm. across in terminal racemose clusters, rhachis pubescent, pedicels ascending-spreading, slender, rigid, 1–2 cm. long, densely lepidote; calyx persistent, shallow, saucer-shape, tube 0.5 mm. long with 5 lanceolate to triangular teeth each 1–1.5 mm. long, lepidote, often ciliolate; corolla rotate-campanulate, lepidote without, 5-lobed, lobes spreading from about the middle; stamens 10, exserted, filaments flattened at the base, glabrous; pistil shorter than the stamens, ovary ovoid, lepidote, style glabrous, stigma simple. Fruit oblong, lepidote, shining dark brown, 0.5–0.8 cm. long, tipped with the persistent style; seeds fusiform, winged at the ends, yellow-brown.

Habitat. Mountains of northern Korea and westward through southern Manchuria, the northern provinces of China to the borders of Thibet with the southern limits of its range in the provinces of Hupeh and Szech'uan.

This interesting Rhododendron was the first known Chinese species. It has a greater range of distribution than any other Chinese Rhododendron extending as it does from the mountains west of Peking to those of the Chino-Tibetan borderland, and, growing in Mongolia and Korea. It has the distinction also of being the only Chinese species hardy in the Arnold Arboretum. As I know it in Hupeh and Szech'uan it grows on cliffs and fully exposed places where it forms masses of irregular shape from 3 to 8 ft. through and tall. It is fairly common as a small bush on the mountains behind Port Arthur in south Manchuria. In foliage and flower it suggests a *Ledum* rather than a *Rhododendron*, and the leaves, like those of other gland-dotted species, are fragrant. The species was

named by Turczaninow from material collected on the Po-hua-shan, some sixty miles west of Peking, about 1835, by Dr. P. Y. Kirilov, a Russian, who was physician to the 11th Russian Ecclesiastic Mission to Peking in 1830. It was, however, discovered almost a century earlier by the Jesuit Father, Pierre D'Icarville, who joined the Chinese mission of the Jesuits and died at Peking in 1757. This learned priest paid much attention to the botany of the Peking district and collected herbarium material. It was he who sent to Europe the seeds from which were raised the first north China plants cultivated in Europe including such trees as *Ailanthus altissima* Swingle, *Sophora japonica* Linn. and *Thuja orientalis* Linn. A few of his specimens were described by Lamarck toward the end of the 18th century but most of them remained untouched in the Muséum d'Histoire Naturelle, in Paris, until 1882 when they were determined by Franchet. So far as I can discover there is no record of *R. micranthum* being introduced into gardens until 1900, when I sent seeds from Hupeh, central China, to Messrs. Veitch.

*Rhododendron Keiskei* Miquel in Ann. Mus. Lugd.-Bat. II. 163 (Prol. Fl. Jap. 95) (1865-66).—Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, xvi. no. 9, 23, t. 4, figs. 11-17 (Rhod. As. Or.) (1870).—Franchet & Savatier, Enum. Pl. Jap. I. 288 (1875).—Hemsley in Bot. Mag. cxxxvi. t. 8300 (1910).—Matsumura, Ind. Pl. Jap. II. pt. 2, 462 (1912).—Bean, Trees & Shrubs Brit. Isl. II. 364 (1914).—Rehder in Bailey, Stand. Cycl. Hort. v. 2938 (1916).—Millais, Rhodod. 198, fig. (1917).—Mottet in Rev. Hort. 1917, 348, t. (1917).

Shrub 1-3 m. tall, much-branched; branches twiggy, sparsely lepidote when young; bud-scales lepidote. Leaves falling in the 2nd year, short-petioled, coriaceous, lanceolate to oblong-lanceolate, sometimes elliptic, 3-6 cm. long, 1-2 cm. wide, acute or rounded and mucronate at apex, narrowed, sometimes rounded, rarely sub-auriculate at base, dark green, finely reticulate, sparsely lepidote above, pale, densely lepidote below; petiole often clad with few bristles and like the midrib of leaf-base usually pubescent. Flowers pale yellow, about 4 cm across, umbellate-corymbose, 3-6; pedicels densely lepidote; calyx minute, saucer-shape, 5-lobed, lobes rounded, often ciliate, densely lepidote; corolla broad-campanulate, 5-lobed, spreading from a short tube, sparsely lepidote without; stamens 10, exserted, unequal, filaments slightly pilose near base, anthers pale; pistil longer than the stamens, ovary ovoid, densely lepidote, style curved, glabrous, stigma small. Fruit cylindric, 1-1.5 cm. long, 3 mm. wide, deeply furrowed; seed wingless, obovoid, shining brown.

Habitat. Japan, Yaku-shima northward through Kyushu, Shikoku and Hondo to the Nikko region.

This species is interesting chiefly on account of its yellow flowers and is related to *R. lutescens* Franchet and *R. triflorum* Hooker f. The bud-scales, pedicels, calyx, ovary and underside of the leaves are densely and the

outside of the corolla-tube, upper surface of the leaves and the young branchlets sparsely dotted with glistening orange-brown scales. Though widely distributed in Japan from the extreme south to the Nikko region it is nowhere really abundant. It is partial to moist woodlands and is often found growing on humus-clad rocks in coniferous forests. On Mt. Kirishima it is fairly common in the forests between 1000 and 4000 ft. elevation. In the Cryptomeria-forests on the island of Yaku-shima I found it growing occasionally on decaying tree-trunks between 1800 and 3000 ft. above sea-level. In the Nikko region, its northern limit, it is rare. The species is named for Keiskō Ito, the father of modern botany in Japan.

*Rhododendron Keiskei* was introduced into cultivation in America by J. G. Jack who sent seeds in the autumn of 1905 from Adera, Shinano province, to the Arboretum of T. E. Proctor, Topsfield, Mass., where it first flowered in May, 1908. It was introduced into Kew from Yokohama in 1908 and flowered in a pot in 1909. In Massachusetts it is not properly hardy but in England it is as hardy as the average species from the Far East.

Komatsu (in Tokyo Bot. Mag. XXXI. [288] (1917)) in Japanese mentions a variety as *R. Keiskei* var. *procumbens*. I think this is only a condition of growth, not worthy of taxonomic recognition.

Millais states that Mr. E. J. P. Magor has crossed *R. Keiskei* with *R. ciliatum* Hook. f., with *R. lutescens* Franch. and with *R. arboreum* Smith. The last-named of these crosses has flowered and has been named

× **Rhododendron Keiskarbor** Magor in Rhodod. Soc. Notes, I. 230 (1920).

*Rhododendron Keiskei* × *arboreum* pink Hort. Magor.

**Rhododendron parvifolium** Adams in Mém. Soc. Nat. Mosc. ix. 237 (1834).—Lebedour, Fl. Ross. II. 921 (1846).—Turczaninow in Bull. Soc. Nat. Mosc. XXI. no. 7, pt. 2, 500 (Fl. Baical. Dahir.) (1848).—Trautvetter & Meyer in Middendorff, Reis. Sib. I. pt. 2, 63 (Fl. Ochot.) (1856).—Regel & Tiling in Nouv. Mém. Soc. Nat. Mosc. XI. 110 (Fl. Ajan.) (1858).—Fr. Schmidt in Mém. Acad. Sci. St. Pétersb. sér. 7, XII. no. 2, 158 (Reis. im Amur-l.) (1868).—Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 17 (Rhod. As. Or.) (1870).—Regel in Gartenfl. XXVI. 163, t. 904 (1877).—Harrow in Gard. Chron. ser. 3, XXXIX. 164, figs. 66, 67 (1906).—Komarov in Act. Hort. Petrop. XXV. 204 (Fl. Mandsh.) (1907).—Schneider, Ill. Handb. Laubholzk. II. 476, fig. 317-a (1909).—Bean, Trees & Shrubs Brit. Isl. II. 371 (1914).—Miyabe & Miyake, Fl. Sachal. 309, no. 384 (1915).—Millais, Rhodod. 224 (1917).—Lynch in Gard. Chron. ser. 3, LXIII. 76, figs. 33, 34 (1918).—Nakai, Fl. Sylv. Kor. pt. VIII. 29, t. 6 (1919).

*Azalea lapponica* Pallas, Fl. Ross. II. 52, t. 70, fig. 1, a (1784), not Wahl.

**Rhododendron palustris** Turczaninow apud De Candolle, Prodr. VII. 724 (1839).

*Rhododendron parvifolium* f. *alpina* Glehn in Act. Hort. Petrop. iv. 66 (1876).

*Rhododendron parvifolium* f. *elata* Glehn l. c.

*Rhododendron confertissimum* Nakai, Veget. Mt. Waigalbon, 36 (1916),  
name only; in Tokyo Bot. Mag. xxxi. 239 (1917); Fl. Sylv. Kor. pt.  
viii. 32, t. 8 (1919).

Shrub 0.1–1.5 m. tall, branches twiggly, densely clothed with rusty-brown lepidote scales, winterbuds with lepidote, ciliolate bud-scales. Leaves persistent, scattered, petiolate, lanceolate to elliptic-lanceolate, 0.5–2 cm. long, 0.3–1 cm. wide, acute or obtuse and mucronate at apex, narrowed at base to the winged petiole, dark green and lepidote above, densely clothed with pale- to rust-colored lepidote glands below. Flowers rosy purple, clustered from 2 to 5 together at end of shoots, 1.5–2 cm. diam. subtended by persistent bud-scales; pedicels 4–8 mm. long, lepidote, calyx saucer-shape, 5-lobed, lobes oval, 0.5–1.5 mm. long, densely lepidote, often ciliate, occasionally colored; corolla wide-campanulate, deeply 5-lobed, the lobes spreading, lanceolate-ovate; stamens 10 (sometimes 7–10), exserted, shorter than corolla-lobes, filaments villose near base; pistil overtopping stamens, ovary ovoid, furrowed, densely lepidote, style rich purple, stigma capitate. Fruit ovoid to oblong-ovoid, 4–6 mm. long, densely lepidote; seeds wingless, obovoid, yellow-brown.

Habitat. Northeastern Asia, eastern Siberia from about 100° E. long. through the Baikal region eastward to Kamtschatka and Saghalien and south to the higher mountains of north Korea.

This species is widely spread in the colder parts of northeastern Asia but does not reach Japan. At the southern limits of the range it is confined to the upper slopes of the higher mountains of Korea but in the north it descends to sea-level on moors and in Sphagnum swamps. When growing freely it is erect and of rather sparse habit but on windswept mountain-slopes it is reduced to a few inches in height and forms broad mats. On such plants Nakai founded his *R. confertissimum*. Of this I gathered seeds on Mt. Setsurei, northern Korea, at 7000 ft. and plants raised from them grew into the ordinary tall, sparsely branched, typical form. This dwarf plant is purely a response to ecological conditions and cannot be maintained as a distinct form. From western China certain species of the section *Lepipherum* have been erroneously referred to *R. parvifolium* but this plant is unknown from China proper.

According to Pallas *R. parvifolium* was discovered by E. Laxmann on the Stanovoi Mountains but was confused with the circumpolar *R. lapponicum* Wahlenb. It has not taken kindly to cultivation in England or America thriving better in Germany and Russia. I have not been able to discover when it was first introduced into cultivation but Regel's fine plate in the *Gartenflora* (xxvi) 163, t. 904 (1877) is the earliest figure of a cultivated plant I have seen. At Edinburgh this plant thrives in the rockery and it is said to grow well in the Cambridge Botanic Garden. In the Arnold Arboretum we have not succeeded in properly establishing it though it is a plant that ought to succeed here.

There is said to be a white-flowered variety

*Rhododendron parvifolium* var. *albiflorum* Herder apud Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, xvi. no. 9, 17 (Rhod. As. Or.) (1870).

This is described as very densely branched with shorter pedicels and white flowers. It was discovered on Mt. Munku-Sardyk at the source of the Irkut River, which is west of the southern end of Lake Baikal, by Gustave Radde between 1855 and 1857. It appears to be unknown in gardens.

### SECT. 3. POGONANTHUM G. Don

*Rhododendron* sect. *Pogonanthum* G. Don, Gen. Syst. III. 845 (1834).

*Rhododendron* sect. *Osmothamnus* Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, xvi. no. 9, 14 (Rhod. As. Or.) (1870), in part.

Represented by.....*R. Adamsii*.

*Rhododendron Adamsii* Rehder in Wilson & Rehder, Monog. Azal. 190 (1921).

*Azalea fragrans* Adams in Mém. Acad. Sci. St. Pétersb. II. 332, t. 14 (1808). *Osmothamnus fragrans* De Candolle, Prodr. VII. 715 (1839).—Ledebour, Fl. Ross. II. 918 (1846), exclud. synon.

*Osmothamnus pallidus* De Candolle, I. c.—Ledebour, I. c., exclud. synon. *Rhododendron fragrans* Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, xvi. no. 9, 16 (Rhod. As Or.) (1870), not Paxton.—Balfour f. in Millais, Rhodod. 171 (1917).

*Rhododendron pallidum* Dummer in Gard. Chron. ser. 3, LIII. 264 (1913), not W. Watson

Shrub 0.2–0.5 m. tall, with verticillate, erect branches densely villose when young and clad with fulvous lepidote scales. Leaves persistent, lepidote, short-petioled, coriaceous, elliptic to elliptic-ovate, 1.4–2 cm. long, 0.6–0.8 cm. wide, acute, obtuse at base, margin incurved, dark green above, fulvous beneath. Flowers pink or white, 7–15, crowded together in a terminal racemose corymb; pedicels 1–2 mm. long, lepidote; calyx saucer-shape, 5-toothed, the teeth unequal, ovate to deltoid, 1–2.5 mm. long, often ciliate; corolla salver-shape, 5-lobed, tube about 8 mm. long, glabrous without, villose within, lobes spreading, rounded; stamens 5, included, filaments puberulous at base; pistil shorter than stamens, ovary ovoid, furrowed, villose and lepidote, style stout, club-shape, stigma lobed. Fruit conic, villose, lepidote.

Habitat. Eastern Siberia, Baikal region north-eastward to the valley of Lena River.

This plant is unknown to me and does not appear to have been introduced into gardens. It seems to be confined to the regions mentioned above and not to reach the coast. The Himalayan *R. anthopogon* D. Don has been confused with Adams' plant but the two species are quite distinct. Several other distinct plants from western China and the Himalayas have been erroneously referred to *R. Adamsii* but this plant is unknown

in either of these regions. It was discovered by early Russian travellers in Siberia, probably by Messerschmidt or Steller, and is mentioned by Gmelin (Fl. Sib. IV. 125, t. 55 [1769]) as "Azalea fol. ovalibus supra rugosis" and is figured but the figure is crude.

#### SECT. 4. RHODORASTRUM MAXIM.

**Rhododendron** sect. **Rhodorastrum** Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 15 (Rhod. As. Or.) (1870).

Represented by..... 8. *R. dauricum*

**Rhododendron dauricum** Linnaeus, Spec. 392 (1753).—Pallas, Fl. Ross. I. 47, t. 32 (1784).—Andrews, Bot. Rep. I. t. 4 (1799).—Sims in Bot. Mag. XVII. t. 636 (1803).—Loddiges, Bot. Cab. VII. t. 605 (1822); XV. t. 1446 (1828).—G. Don, Gen. Syst. III. 845 (1834).—Loudon, Arb. Brit. II. 1138, fig. 939 (1838).—DeCandolle, Prodr. VII. 725 (1839).—S. O. in Loudon, Gard. Mag. n. ser. VII. 462 (1841).—Lebedour, Fl. Ross. II. 921 (1846).—Turczaninow in Bull. Soc. Nat. Mosc. XXI. no. 7, pt. 2, 501 (Fl. Baical. Daur.). (1848).—Maximowicz in Mém. Acad. Sci. Sav. Etr. St. Pétersb. IX. 189 (Prim. Fl. Amur.) (1859); in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 43 (Rhod. As. Or.) (1870).—Trautvetter & Meyer in Middendorff, Reis. Sib. I. pt. 2, 63 (Fl. Ochot.) (1856).—Regel in Mém. Acad. Sci. St. Pétersb. sér. 7, IV. no. 4, 102 (Tent. Fl. Ussur.) (1861).—P. A. in Gartenwelt, VII. 413, fig. (1903).—Komarov in Act. Hort. Petrop. XXV. 200 (Fl. Mandsh. III.) (1907).—Schneider, Ill. Handb. Laubholzk. II. 471, figs. 314 a-b, 316 c-f. (1909).—Nakai in Jour. Coll. Sci. Tokyo, XXXI. 75 (Fl. Kor. II.) (1911); Fl. Sylv. Kor. pt. VIII. 33, t. 9 (1919).—Dallimore in Garden, LXXVII. 18, fig. (1913).—Osborn in Gard. Chron. ser. 3, LIII. 51, fig. 26 (1913).—Bean, Trees & Shrubs Brit. Isl. II. 352 (1914).—Rehder in Bailey, Stand. Cycl. Hort. V. 2938 (1916).—Millais, Rhodod. 152 (1917).

*Rhododendron dahuricum* β. *roseum* DeCandolle, Prodr. VII. 725 (1839).

*Rhododendron dahuricum* var. *pallidum* Regel in Gartenfl. XI. 377 (1862).

*Rhododendron dahuricum* α. *dahuricum* Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 44 (Rhod. As. Or.) (1870).—Matsumura, Ind. Pl. Jap. II. pt. 2, 459 (1912).

*Azalea dahurica* K. Koch, Dendr. II. 181 (1872).

*Rhodora canadensis* Beziat in Jardin, XX. 57, figs. 31, 32 (1906), not Linnaeus.

A much-branched shrub 1–2 m. tall, branches twiggy, ascending, lepidote, bud-scales densely lepidote. Leaves deciduous or persisting through the winter to the late spring, petioled, elliptic to elliptic-ovate, often lanceolate on free shoots, coriaceous, 1–5 cm. long, 0.6–2 cm. wide, rounded to obtuse, sometimes mucronulate at apex, rounded or narrowed at base, dark green lepidote, finely reticulate above, pale green to rust-brown and densely lepidote below, margin waved. Flowers precocious, solitary or in a cluster at end of the shoot each from separate bud, bright red-purple, 3–3.5 cm. across; peduncle surrounded by persistent bud-scales; calyx minute with 5 deltoid teeth, lepidote; corolla wide-campanu-

late, pubescent without on basal half, 5-lobed, lobes spreading almost horizontally from the short tube, rounded, waved; stamens 10, filaments color of corolla, villose on lower half, anthers nearly black; pistil longer than stamens, ovary green, conic, furrowed, densely lepidote, style crimson, curved, stigma small, dark-colored. Fruit oblong, 0.8–1.2 cm. long, furrowed, lepidote; seeds wingless, obovoid, yellow-brown.

Habitat. Altai mountains in central Siberia eastward to the Japan Sea, Korea and Hokkaido.

This species was one of the earliest known Rhododendrons and is the only one within our region mentioned in the first edition of Linnaeus' *Species Plantarum*. It was discovered by D. G. Messerschmidt sometime between 1720 and 1727 and is well figured by Amman (*Stirp. Rar. Icon. & Des.* 181, t. 27 (1739) under the name of "Chamaerhododendros folio glabro, majusculo, ampio flore roseo." Gmelin (*Fl. Sib.* iv. 125 [1769]) refers to it as "Andromeda foliis ovatis floribus patentibus, subsessilibus." It was introduced into Petrograd by Pallas and, according to Aiton (*Hort. Kew.* 66 [1789]), into England by Anthony Chamier, Esq., in 1780. With its bright red-purple, flattish flowers *R. dauricum* is really a pretty shrub and is one of the earliest to flower in the spring. It is a boreal plant and probably thrives better in eastern North America than it does in England but even here its expanded flowers are often destroyed by frost. The leaves of the typical form are usually quite deciduous and in autumn change to yellow and blackish bronze. The leaves on crushing or drying are pleasantly fragrant. Quite often this shrub opens flowers freely in late November as was the case last year when on November 20th in the Arnold Arboretum one plant bore over fifty fully expanded flowers.

**Rhododendron dauricum** var. **semperfurens** Sims in *Bot. Mag.* XLIV. t. 1888 (February, 1817).—Loddiges in *Bot. Cab.* XVI. t. 1584 (1829).—DeCandolle, *Prodr.* VII. 725 (1839).—Mottet in *Rev. Hort.* 1908, 198, fig. 78.—Bean, *Trees & Shrubs Brit. Isl.* II. 352 (1914).—Rehder in Bailey, *Stand. Cycl. Hort.* V. 2939 (1916).

*Rhododendron dauricum*  $\beta.$  *atrovirens* Ker-Gawler in *Bot. Reg.* III. t. 194 (May, 1817).—L. Spaeth in *Gartenfl.* LIII. 267, figs. 39, 40 (1904).

This variety is distinguished by its persistent leaves; the flowers are dark red-purple and about the size of those of the type. It is a native of the Altai region and is supposed to have been introduced into England from Russia by Thomas Bell about 1798. It flowered in the nursery of Messrs. Whitley, Braine & Milne at Parson's Green, in 1817 and was named and figured by Sims.

The typical form has leaves about 2.5 cm. long and 1.2 cm. broad but there is cultivated in the Edinburgh Botanic Gardens a plant with leaves only half this size.

Another evergreen variety the flowers of which have no stamens, is mentioned by Millais as *R. dauricum* var. *emasculum* (*Rhodod.* 152 [1917]).

**Rhododendron dauricum** var. **mucronulatum** Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, xvi. no. 9, 44 (Rhod. As. Or. (1870).—Hemsley in Jour. Linn. Soc. xxvi. 22 (1889).—Matsumura Ind. Pl. Jap. ii. pt. 2, 459 (1912).

*Rhododendron mucronulatum* Turczaninow in Bull. Soc. Nat. Mosc. x. no. 7, 155 (1837); in Bull. Soc. Nat. Mosc. xxi. pt. 2, 502 (Fl. Baical. Dahur.) (1848).—DeCandolle, Prodr. vii. 727 (1839).—Sargent in Gard. & For. ix. 64, fig. 7 (1896).—St. Paul in Mitteil. Deutsch. Dendr. Ges. vii. 1, t. (1898).—Schneider, Ill. Handb. Laubholzk. II. 472, figs. 314 c-d, 316 a-b (1909).—Hemsley in Bot. Mag. cxxxvi. t. 8304 (1910).—Nakai in Jour. Coll. Sci. Tokyo, xxxi. 75 (Fl. Kor. II.) (1911); Fl. Sylv. Kor. pt. VIII. 35, t. 10 (1919).—Bean, Trees & Shrubs Brit. Isl. II. 353 (1914).—Rehder in Bailey, Stand. Cycl. Hort. v. 2939, fig. 3382 (1916).

*Rhododendron dauricum* Maximowicz in Mém. Acad. Sci. Sav. Etr. St. Pétersb. ix. 189 (Prim. Fl. Amur.) (1859), in part.

*Rhododendron Taquetii* Léveillé in Fedde, Rep. Nov. Spec. xii. 101 (1913).

*Rhododendron mucronulatum* var. *Taquetii* Nakai, Rep. Veget. Quelpaert, 71 (1914), name only.

This variety may be regarded as the southeastern form of the type being common from the Amur region southward. It occurs in Hokkaido where it is rare and finds the western limits of its range in the Chinese province of Chihli.

It is well-distinguished by its larger, less coriaceous leaves which are sometimes 7 cm. long and 4 cm. wide and usually pale on the underside, with crenate-serrate margins. The flowers are larger being often 4 cm. across, of a more pleasing shade of color and sometimes the lobes are not so deeply cleft and in consequence the flower is less flattened and more bell-shaped. The fruit, too, is usually stouter and about 1.5 cm. long. The flowers open in the Arnold Arboretum in April and early May and are remarkably resistant to frost. The variety is in many ways a superior garden plant to the type, but unfortunately, as Maximowicz points out, there are intermediate forms and I do not see how it can be maintained as a species. It is especially abundant in Korea from the mountains of the extreme north to Quelpaert. It is a common undergrowth in the open Larch-forests on the volcanic soils of north Korea where it is often 10 ft. tall. Its leaves are pleasantly fragrant when crushed or dried like those of the type and the autumn tints are similar. In Korea it is one of the first shrubs to open its flowers in the Spring and being everywhere abundant—in open rocky country, mountain slopes, cliffs and woodlands—is a prominent feature of the vegetation.

This useful plant was discovered on Po-hua-shan, a mountain west of Peking, by Dr. P. Y. Kirilow, about 1835 and introduced into cultivation by Dr. Bretschneider who sent seeds from the type locality to the Arnold Arboretum in 1882. It flowered for the first time in the spring of 1888, in the garden of Professor Sargent at Home Lea, Brookline. Each season since it has never failed to cover itself with flowers in the spring and a cheerful mass of tinted leaves in the autumn. The leaves are entirely deciduous; and it is a first-rate garden plant.

**Rhododendron dauricum** var. *ciliatum* Wilson, n. comb.

*Rhododendron mucronulatum* var. *ciliatum* Nakai in Tokyo Bot. Mag. xxxi. 241 (1917); Fl. Sylv. Kor. pt. viii. 37, t. 11 (1919).

This variety is distinguished by its ciliate leaves and petioles. A few appressed, strigose hairs occur on the upper surface of the leaf; the flowers in size are similar to those of the var. *mucronulatum* Maxim. The ciliation makes the typical form quite distinct but it varies in quantity and on some plants is reduced to a few hairs on the petiole.

Nakai, who founded the variety, gives central and southern Korea including the islands of Quelpaert, Tsushima Island, western Hondo and Kyushu as the range of distribution of this variety. I have seen no material from Japan, but I am familiar with it in Korea and a specimen from the hills round Chefoo in China is intermediate in character. On the Diamond Mountains it is particularly common and from there I sent seeds to the Arnold Arboretum in 1917. Plants raised from these seeds flowered for the first time in 1920 under glass. The plant has proved perfectly hardy in the Arnold Arboretum and its garden value would appear to be the same as the var. *mucronulatum* Maxim.

A variety with white flowers is

**Rhododendron dauricum** var. *album* De Candolle Prodr. vii. 725 (1839).

*Rhododendron dahuricum*  $\beta.$  *albiflorum* Turczaninow in Bull. Soc. Nat. Mosc. xxii. pt. 2, 501 (Fl. Baical. Dahir.) (1848).

*Rhododendron mucronulatum* var. *albiflorum* Nakai in Jour. Coll. Sci. Tokyo xxxi. 76 (Fl. Kor. II.) (1911); Fl. Sylv. Kor. pt. viii. 37 (1919).

This albino form was discovered by N. Turczaninow in woods near the Angara River in central Siberia sometime between 1828 and 1836. Nakai quite recently found it in Korea. I have not heard of its appearance in our gardens.

Of the several hybrids of which *R. dauricum* Linn. and its varieties are part parents the first I find record of is

 $\times$  **Rhododendron aprilis** Lindley in Bot. Reg. xxix. t. 62 (1843).

This was raised by Dean Herbert by impregnating *R. ponticum* Linn. with pollen from *R. dauricum* var. *semperflorens* Sims. The figure shows an evergreen Rhododendron bearing a compact truss of pale pink flowers with yellow honey-guides on the dorsal segments.

A popular hybrid is

$\times$  **Rhododendron praecox** Carrière in Rev. Hort. 1868; 211, t. (= *R. ciliatum* Hook. f.  $\times$  *R. dauricum* Linn.).—Gard. Chron. n. s. ix. 335 (1878); xvii. 295, fig. 40 (1882).—W. in Garden, xxxviii. 32, t. 761 (1890).—W. W. in Gard. Chron. ser. 3, xii. 762, fig. 124 (1892).—Dallimore in Garden, lxi. 277, fig. (1901).—Garden, lxi. 428, fig. (1902).—W. A. Watts in Garden, lxxi. 151, fig. (1907).—Bean, Trees & Shrubs Brit. Isl. II. 350 (1914).—Rehder in Bailey, Stand. Cycl. Hort. v. 2938 (1916).

This well-known hybrid is characterised by its broad, funnel-form rose-purple to lilac flowers with corollas about 3.5 cm. across, by its ovate, ciliate calyx-lobes and by its few-flowered clusters. The leaves are persistent, from 2.5–5 cm. long, more or less oval, sparingly ciliate, with rusty-brown lepidote glands on the underside. It is a much more beautiful shrub in flower than *R. dauricum* Linn. but is less hardy. This is to be expected from the influence of the Himalayan *R. ciliatum* Hook. f. In the Arnold Arboretum we can keep it alive but the foliage and flowers are usually injured every year.

This hybrid was raised by Mr. Isaac Davies of Ormskirk Nurseries, Wavertree, near Liverpool and was exhibited before the Royal Horticultural Society in 1861, as told in the Gardeners' Chronicle for 1878.

There are several forms of *R. praecox* in cultivation including f. *grandiflorum* Cripps, with larger leaves and flowers, raised at Tunbridge Wells by Messrs. Cripps, and the f. *rubrum* Hort. so beautifully figured in the Garden, xxxviii. 32, t. 761 (1890).

A hybrid of the second generation is

× *Rhododendron praecox* var. "Early Gem" *Rhododendron* "Early Gem" Gard. Chron. n. s. ix. 335, fig. 57 [1878] which is *R. praecox* × *R. dauricum*. This has foliage like that of *R. dauricum* and an inflorescence like × *R. praecox* but with larger flowers. It was raised at Coombe Wood nurseries by Messrs. Veitch and is figured in the Gardeners' Chronicle, 1878. In the Arnold Arboretum its hardiness is not greater than that of *R. praecox*.

## SUBGEN. II. AZALEASTRUM PLANCH.

*Rhododendron* subgen. *Azaleastrum* Planchon in Rev. Hort. 1854, 43.—Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, xvi. no. 9, 15 (Rhod. As. Or.) (1870).—Rehder in Wilson & Rehder, Monog. Azal. 109, in text (1921).

*Azaleastrum* Rydberg in Mem. New York Bot. Gard. i. 297 (1900), as a genus. Represented by ..... 9. *R. semibarbatum*

*Rhododendron semibarbatum* Maximowicz in Bull. Acad. Sci. St. Pétersb. sér. 3, xv. 230 (Mél. Biol. vii. 338) (1870); in Mém. Acad. Sci. St. Pétersb. sér. 7, xvi. no. 9, 45 (Rhod. As. Or.) (1870).—Regel in Gartenfl. xxiv. 292, t. 666 (1870).—Franchet & Savatier, Enum. Pl. Jap. i. 293 (1875).—Matsumura, Ind. Pl. Jap. ii. pt. 2, 464 (1912).—Hutchinson in Millais, Rhodod. 240 (1917).

*Azalea semibarbata* Kuntze, Rev. Gen. ii. 387 (1891).

*Azaleastrum semibarbatum* Makino in Tokyo Bot. Mag. xxviii. 338 (1914). *Mumeazalea semibarbata* Makino l. c., as a synonym.

Shrub 0.8–2 m. tall, branches twiggy, ascending and spreading, pubescent and with long straight gland-tipped hairs. Leaves deciduous, scattered

on the free shoots, crowded on others, petiolate, subcordaceous, oval to lanceolate-ovate, 1–5 cm. long, 0.5–2.5 cm. wide, rounded or obtuse, sometimes truncate and slightly emarginate, apiculate at apex, rounded or narrowed at base, crenate-serrate, often ciliolate, dark green above, pale below, pubescent on the midrib on both surfaces; petiole slender, 4–12 mm. long, pubescent, often bearded with long, gland-tipped hairs. Flowers opening after the leafy-shoots have developed, solitary from axillary clustered buds, subtended by persistent paleaceous bud-scales, white spotted with red, about 2 cm. across; pedicels glandular; calyx a disc with 5 minute teeth, densely glandular and ciliolate; corolla sub-rotate, with 5 more or less oval lobes spreading from a short tube; stamens 5, exserted, unequal, 3 long, 2 short, divergent, filaments densely villose in basal half; pistil shorter than stamens, ovary densely stipitately glandular, style glabrous, persistent, stigma capitate. Fruit subglobose, about 4 mm. long, shining, brownish black, densely stipitately glandular; seeds wingless, obovoid, very dark brown.

Habitat. Japan, mountains of Kyushu, Shikoku and Hondo from Mt. Kirishima northward to Mt. Iwate.

This is an odd-looking, very glandular plant with small, concealed flowers produced singly from a lateral bud. At the end of the shoot a cluster of buds are formed, the central one develops into a leafy shoot and the lateral ones, of which there may be 5 or 6, each produces a solitary flower; the whole forms a false cluster, the flower-stalks are hidden among the chaffy bud-scales. The flowers are small and hidden beneath the leaves. The fruit is very sticky and being small gathering seed is a tedious business. The autumn tints of the leaves range from yellow and orange to crimson. This species is wide-spread in Japan where I have gathered it from Kirishima in the south to Matsushima in northern Hondo. In the woods bordering the Otake-gawa in Shinano province it is abundant. It forms a rather narrow bush and may be from one to six feet high. It was discovered by Maximowicz's collector, Tschonoski, who sent seeds to the Botanic Garden, Petrograd, where it flowered in 1870 in a greenhouse and was figured by Regel in the *Gartenflora*. In 1914, I collected seed and plants were raised and distributed by the Arnold Arboretum. This species can only recommend itself to the collector for its flowers have little in the way of beauty. In the Arnold Arboretum it has not proved hardy though I think it should be.

### SUBGEN. III. THERORHODION REHD.

*Rhododendron* subgen. *Therorhodion* Rehder in Wilson & Rehder, Monog. Azal. 109, in text (1921), as a subgenus.

*Rhododendron* sect. *Therorhodion* Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, xvi. 15 (Rhod. As. Or.) (1870).

*Therorhodion* Small in North Am. Fl. xxix. pt. 1, 45 (1914), as a genus.

## KEY TO THE SPECIES

Leaves petiolate, obovate to spathulate, an inch or more long, venation prominent; flowers an inch or more in diameter.....10. *R. kamtschaticum*.  
 Leaves sessile, lanceolate to oblanceolate, less than an inch long, venation not prominent; flowers less than an inch in diameter.....11. *R. Redowskianum*.

**Rhododendron kamtschaticum** Pallas, Fl. Ross. I. 48, t. 33 (1784).—Chamisso & Schlechtendal in Linnaea, I. 513 (1826).—Loudon, Arb. Brit. II. 1139, fig. 9, 40 (1838).—De Candolle Prodr. VII. 726 (1839).—Hooker, Fl. Bor. Am. II. 43 (1839).—Maximowicz in Mém. Acad. Sci. St. Pétersb. sér. 7, XVI. no. 9, 47 (Rhod. As. Or.) (1870).—Franchet & Savatier, Enum. Pl. Jap. I. 293 (1875).—Regel in Gartenfl. XXXVI. 593, t. 1200 (1887).—Hutchinson in Bot. Mag. CXXXIV. t. 8210 (1908).—Schneider, Ill. Handb. Laubholzk. II. 507, figs. 331 p-r, 333-e (1909).—Wocke in Gartenwelt, XIII. 554, fig. (1909).—Matsumura, Ind. Pl. Jap. II. pt. 2, 462 (1912).—Bean, Trees & Shrubs Brit. Isl. II. 363 (1914).—Miyabe & Miyake, Fl. Sachal. 310, no. 386 (1915).—Millais, Rhodod. 198 (1917).

*Rhodothamnus kamtschaticus* Lindley in Lindley & Paxton, Flow. Gard. I. 113, t. 22 (1850).—Lemaire in Jard. Fleur. I. t. 53 (1851).

*Therorhodion camtschaticum* Small in North Am. Fl. XXIX. pt. 1, 45 (1914).

A much-branched shrub, 15–30 cm. high, current season's shoots sparsely glandularly pilose, shining brown. Leaves deciduous, often crowded, short-petioled, membranous, obovate to spathulate, 2.5–4 cm. long, 1–2.5 cm. wide, rounded and mucronate at apex, narrowed at base into the winged petiole, glandular-ciliate, reticulate above, venation prominent below, with few strigose hairs on principal veins. Flowers solitary<sup>1</sup> or racemously 2–3 rose-purple, bowl-shape 2.5–3.5 cm. across; pedicels erect, 1.5–3.5 cm. long, glandularly pilose; bracts foliaceous; calyx green, foliaceous, persistent, deeply 5-lobed, lobes oblong-elliptic, 1–1.5 cm. long 0.4–0.6 cm. wide, obtuse, mucronate, glandular-ciliate; corolla deeply 5-lobed, lobes spreading from a short tube 3–6 mm. long, elliptic to ovate-elliptic, 1.5–2.5 cm. long, 1–1.5 cm. wide, villose at base within; stamens 10, unequal, filaments color of corolla, villose near base, anthers blackish; pistil longer than stamens, ovary conic, clothed with gray villous hairs, style curved, stigma slightly capitate. Fruit ovoid, 1–1.2 cm. long, glabrescent, enclosed within persistent calyx; seeds wingless, minute, obovoid, shining yellow-brown.

<sup>1</sup> It is frequently stated that the flowers of *R. kamtschaticum* Pall. and its relative *R. Redowskianum* Maxim. are borne on "special leafy shoots" or are "terminal on leafy shoots." The flowers certainly develop from a "terminal" and "special" bud, as they do in the sections Leiorhodion and Lepipherum of the subgenus Eurhododendron but I would regard the "leafy shoot" as a bracteate peduncle which may bear a solitary flower or it may develop into a few-flowered raceme by the appearance of from one to three additional pedicels from the axis of the foliaceous bracts. That is this peduncle is the homologue of the rhachis in the racemose-umbellate flowered species, the difference being that it is more elongated, the pedicel often adnate for some distance giving the false appearance of dichotomous branching and that the bracts and bracteoles are foliaceous instead of membranous. This peduncle or rhachis does not develop any buds after the ripening of the fruit and is deciduous.

Habitat. Japan, northern Hondo and Hokkaido; Kuriles, Saghalien, Kamtschatka, Aleutian Islands to Alaska and southward to Banks Island, British Columbia.

This pretty plant of boreal regions strongly suggests a *Cistus* and is very unlike an ordinary *Rhododendron*. It is widely distributed through regions just south of the arctic circle and has the distinction of being the only species of *Rhododendron* common to Asia and North America. Millais says it is also abundant in west Greenland, but surely he is mistaken. I can find no other record of this plant growing in Greenland and conjecture that Millais has confused it with *R. lapponicum* Wahlenb. which is a common plant there. In Asia it has the southern limits of its distribution on the mountain peaks of northern Hondo where, however, it is very rare. It is partial to sphagnum bogs and marshy places and on the mountains is found growing beneath taller shrubs in regions where the annual precipitation is considerable and uniform.

According to Loudon it was introduced into English gardens in 1802 (Bean says 1799) but it has proved a difficult subject to cultivate. It is quite hardy in Massachusetts and does well in the Proctor Arboretum, Topsfield.

There is said to be a white-flowered variety

***Rhododendron kamtschaticum* var. *albiflorum*** Koidzumi in Tokyo Bot. Mag. xxxi. 34 (1917).

The author gives Mt. Nutakkamshipe in Hokkaido as the locality for this albino.

***Rhododendron Redowskianum*** Maximowicz in Méém. Acad. Sci. Sav. Etr. St. Pétersb. ix. 189 (Prim. Fl. Amur.) (1859); in Méém. Acad. Sci. St. Pétersb. sér. 7, xvi. no. 9, 48, t. 2, figs. 21–25 (Rhod. As. Or.) (1870).—Fr. Schmidt in Méém. Acad. Sci. St. Pétersb. sér. 7, xii. no. 2, 55 (Reis. im Amur-l.) (1868).—Komarov in Act. Hort. Petrop. xxv. 208 (Fl. Mandsh. III.) (1907).—Schneider, Ill. Hand. Laubholzk. II. 508, fig. 333 f–h (1909).—Millais, Rhodod. 234 (1917).—Nakai, Fl. Sylv. Kor. pt. VIII. 38, t. 12 (1919).

*Rhododendron Chamaecistus* Chamisso & Schlechtendal in Linnaea, I. 513 (1826), not Linnaeus.—Ledebour, Fl. Ross. II. 921 (1846).

A much-branched shrub, 5–15 cm. high, branches spreading on the ground, angular, clothed with adpressed leaf-bases, pubescent between pulvini. Leaves deciduous, clustered, membranous, sessile, oblanceolate to lanceolate, 5–10 mm. long, 3–5 mm. wide, acute or rounded at apex, narrow at base, crenate-serrate, glandularly ciliate, veins slightly impressed above, prominent below. Flowers 1–3, rose-purple, about 2.5 cm. across; peduncle and pedicel pubescent and glandular, pedicels 8–12 mm. long; bracts leaf-like; calyx foliaceous, deeply 5-cleft, persistent, lobes oblong-lanceolate, 5–6 mm. long, 2–3 mm. wide, acute, pubescent, glandularly

ciliate; corolla deeply 5-cleft, lobes spreading from a short tube, erose; stamens 10, unequal, filaments slender, densely villose at base, anthers relatively large, dark purple; pistil shorter than stamens, ovary densely villose, style relatively stout, curved, persistent, pilose at base, stigma capitate. Fruit ovoid, 5–8 mm. long, pubescent, enclosed within the colored, persistent calyx, topped with style; seeds minute, wingless.

Habitat. Northeastern Asia, alpine regions from the Stanovoi Mountains eastward; Korea, higher mountains of the north.

This tiny alpine plant is in many ways a diminutive of its close relative, *R. kamtschaticum* Pall. It appears to be confined to continental northeastern Asia and finds its southern limit of distribution on Paktu-san and a few other of the high mountains of Korea. It was discovered early in the nineteenth century on the Stanovoi Mountains by a Russian traveller, Redowsky, but was confused with the European *R. Chamaecistus* Linn. now known as *Rhodothamnus Chamaecistus* Reichb. I did not see it growing in Korea and do not know that it has been introduced into gardens.

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## INCUNABULA IN THE LIBRARY OF THE ARNOLD ARBORETUM

ETHELYN M. TUCKER

To the bibliophile perhaps no class of books is so interesting as the incunabula, important not only from the point of view of the history of printing but also for their artistic and scientific value. The typographical interest of the 15th century books predominated for so many years that their scientific interest was for a time almost lost sight of, and fortunate is the scientific library which now possesses a few of these treasures, bearing on its particular subject.

In 1905 the Arnold Arboretum Library received by gift from Mrs. J. Montgomery Sears its first book printed before the year 1500. It has gradually acquired others, largely by gift from Mrs. Sears, and by her recent gift of three important books the collection has received a notable addition. These recent gifts are her copy of the HERBARIUM of APULEIUS PLATONICUS or BARBARUS, probably the only copy in the United States, and two works of Columella, of which no other copies have been reported in this country, namely:

Jo. Moderati Columelle ortuli commentariū || incipit feliciter. [Romae, Steph Plannck.] ff. 10. Hain 5495; and

Lucii Junii Moderati Columelle de Cultu || hortorum Liber xi. Quem. Pub. Virgilius || M. i. Georgicis Posteris edendum dimissit || Ad eiusdē Carmen Prefatio. ff. 10. Hain 5498.

For the following note on the HERBARIUM of APULEIUS I have drawn from Mrs. Arber's "Herbals," and Dr. Arnold C. Kleb's "Herbals of the

fifteenth century." Little is known of the author, who lived in the fourth or fifth century and seems to have been neither Roman nor Greek, hence his epithet *BARBARUS*. "There is not the slightest evidence that he had anything in common with Lucius Apuleius of Madaura in Numidia (born about 125 A.D.)" with whom, however, he is sometimes confused. The *HERBARIUM*, based on classical writings, especially those of Dioscorides and Pliny, and of which many manuscripts were in circulation from the sixth or seventh century on, is among the earliest to which the term "Herbal" is generally applied, and is perhaps the first by which any kind of systematic knowledge of medicinal plants was brought into Britain. "Four early printed editions of the *Herbal of APULEIUS PLATONICUS* are known, all of which appear to have been based on different manuscripts. The earliest was published in Rome late in the fifteenth century from a manuscript discovered by Joh. Philippus de Lignamine, physician to Pope Sixtus IV. The passage of the earliest printed books through the press was naturally extremely slow giving the printer opportunity to make alterations so that books actually belonging to the same edition show variations." Thus, of the extant edition of *APULEIUS' HERBARIUM* two variants seem to exist which Dr. Klebs designates as *a* and *b*.

*a* Dedicatory epistle to F. de Gonzaga Cardina || Mantuanum . . .

*b* Dedicatory epistle to D. Iuliano de Ru || vere Ro. Se. Episcopo  
Cardinali || Sabinensi

There is considerable difference in the dates attributed to this latter variant. Banks states "Editio non est posterior anno 1471, quo Cardinalis de Ruvere Pontifex electus fuit Maximus." This is probably due to Banks' confusion of Francesco della Rovere (Pope Sixtus IV) with Julius della Rovere to whom this book is dedicated. Pritzel evidently copied Banks. The British Museum gives 1480 as the date but Dr. Klebs in the following note places it at 1483 or 1484.

"Lignamine had a press in his house, but probably never printed himself. In his somewhat loquacious dedicatory epistles he usually gives interesting information. Since Cardinal Gonzaga died in October, 1483, it is very likely that the dedication to the nephew of the pope, Cardinal Giulio della Rovere, was substituted during the printing. Therefore variant *b* is the later and the date of printing 1483 or 1484 can be fixed with fair accuracy. Mrs. Sears' copy must be variant *b*, because Lignamine's epistle ends on 4a, blank in both Hain's and the British Museum copies." Hain 1322 in his citation of what Dr. Klebs is pleased to call variant *a*, says, "Impr. est a 1484. Extant exempl. c. dedicatoria ad Julium della Rovere," (a fact which Dr. Klebs seems to have overlooked). In which case variant *b*, the later variant, could not be 1483. Furthermore Dr. Klebs' conclusion that Mrs. Sears' copy is variant *b* is not well grounded, since its first leaf is folio 7a, at the head of which within a wreath of leaves is "Incipit || Herbarium Apulei Plato || nisi ad Mar || cum Agrip || pam." Three leaves of the dedicatory epistle are altogether wanting, ff. 4a (upon

which he bases his conclusion)—6b are loose, of a different paper and smaller page, seeming to prove that they were taken from some other copy, and ff. 6a–6b are plainly manuscript (a few leaves at the end are also wanting). Hain's date of 1484 seems the safest for us to accept.

COLUMELLA was born probably at Cadiz, (Gades) and wrote in the first half of the first century. He was the author of the most important Latin work on ancient agriculture, "De re rustica" in twelve books of which "De cultu hortorum" forming the tenth, not the eleventh as given in the title, is in verse. That "Liber xi," is a typographical error is evident from comparison with copies of "De re rustica" in the Arboretum library.

Both the "Ortuli" and the "De cultu hortorum," are extremely rare. The latter is, according to Brunet, "Editio princeps;" it is by an unknown Italian printer "D. S." (by whom it is signed) and is not known in any of the French libraries.

Other incunabula in the library are given in the following list, each entry giving reference to Hain's "Repertorium bibliographicum," with frequent reference to Dr. Arnold Klebs' "Incunabula lists, 1." To Mr. George P. Winship, librarian of the Widener Collection at Harvard University, I am also indebted for help in identifying some of our copies.

BARBARUS, Hermolaus. *Castigationes Plinij Hermolai Barbari.*

[Rome. 1492–93.] G.L.

Hain 2420.

By an unknown or unidentified printer. In modern binding.

Gift of Mrs. Sears.

BARTHOLOMAEUS ANGLICUS (sometimes called DE GLANVILLA). *De proprietatibus rerum.* [Lyons. Impressus per Nicolaus pistoris de Benssheym et Marcum reinhardi de Argentina socios. 1480 die vero Julij 29.] G.L.

Hain 2500.

In modern binding, leather back.

Gift of Mrs. Sears.

— Liber de proprietatib<sup>9</sup> rerum. [Impressus Argentine.

1491.] G.L.

Hain 2509.

In old vellum.

Gift of Mrs. Sears.

CRESCENTIIS, Petrus de. [Opus ruralium commodorum. 1490?] G.L.

Hain 5826.

Petri de crescentiis Ciuis Bo || nonieñ. in commodu ruralium || cum figuris libri duodecim. (B. M. Printed at Speier by Peter Drach.)

Bound in oak boards, one half covered with leather beautifully stamped, and with original clasps. The date is undetermined, probably 1490. On the fly-leaf is written in an ancient German script "Oldest printed work on agriculture, probably 1471."

The 40th of all printed books." This refers evidently to the earliest edition which has place, printer and date, and not to the Arboretum copy.

Gift of Mrs. Sears in 1905, first fifteenth century book received by the Library.

**HERBOLARIUM** seu de virtutibus herbarum. [Impressum Vincēciæ, per Magistrum Leonar || dum de Basilea & Guilielmum de papia Socios. 1491, die 27 meñ. Octob.]

Hain 8451.

Bound in brown morocco, with blind tooling. Numerous early MS notes in margin, and English translation of preface in MS on fly leaf. Eight of the woodcuts are colored by hand, apparently by an early owner.

Gift of Mrs. Sears.

**ORTUS sanitatis.** Klebs [Strasburg, Prüss. c. 1497.]. Copinger [1490.]  
G.L.

Hain 8941.

In modern vellum, lettered "Editio princeps." Both sides of the first folio are covered with a transparent mending paper. Below the title is written in faded ink, "Anno Domini MDccccclxxxvii. xii Kalend. Novembris." The remaining MS is undecipherable, it may be the name of the owner and the writer of the date. The initial letters are red or blue.

Gift of Mrs. Sears.

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— Klebs [Strasburg, Prüss. c. 1496.] Copinger [1487.] G.L.  
Hain 8942.

Bound in red morocco, beautifully tooled. Initial letters red or blue.  
Gift of Mrs. Sears.

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— [Mainz, Meydenbach. 1491, 23 Jun.]  
Hain 8944.

In oak boards, half covered with old vellum, blind tooled, parts of clasps. Above the title is written "Ex Bibliotheca Windhogiana."

Gift of Mrs. Bayard Thayer.

**HERBARIUS** zu teutsch. [Mainz, Schoeffer. 1485, 28 Mar.] G.L.  
Hain 8948.

This Herbarius is the original of the whole Ortus family.

Bound in a sheet of vellum manuscript. A fuller description is given in this *Journal*, vol. iii, no. 1.

Gift of Mrs. Sears.

**MACER FLORIDUS.** De viribus herba<sup>4</sup> Famosissimus medicus et medico<sup>4</sup> Speculum.

Hain 10417.

By an unidentified Paris press, before 1500.

Bound in brown morocco with blind tooling, MS notes in faded ink.  
Of this copy Dr. Klebs says it "represents an edition which so far as I know has never been described."

Gift of Mrs. Sears.

**OPERA AGRICOLATIONUM** (*Scriptores rei rusticae*). [Regii, Bruschus. 1482, 9 Junii.]

Hain 14565.

Bound in old vellum. From the library of George Dunn.

\_\_\_\_\_ [Impressa Regii impēsī Diōysii Bertochi Regien. imperante. 1496, 13 Kalen Octobris.]

Hain 14569.

Gift of Mrs. Sears.

**MATTHAEUS SYLVATICUS.** *Liber pandectarum medicine.* [Argentorati? c. 1470.] G.L.

Hain 15192.

In boards covered with brown leather, blind tooled and with marks of old clasps. From the library of George Dunn.

Gift of Mrs. Sears.

\_\_\_\_\_ [Venetiis, impēdio Johannis Colonie Agrippinesis Johannisqz māthen ghertzen socios<sup>4</sup>. 1480, sexto idus octobris.]

Hain 15198.

In old vellum, blind tooled, with old clasps and swivel for chain.

Gift of Mrs. Sears.

**THEOPHRASTUS ERESIOS.** *De historia plantarum lib. ix et decimi principium duntaxat, eiusdem de causis plantarum lib. v* [vi. 148-?]

Bound in brown stamped leather. Date quite undetermined, may belong to early part of sixteenth century.

Gift of Mrs. Sears.

**VINCENTIUS BELLOVACENSIS.** *Speculum naturale.* 2 vol. [Strassburg, Adolf Rusch? 1479?] G.L.

Two illuminated letters, initial letters red.

Gift of Mrs. Sears.

\_\_\_\_\_ 3 vol. [Basel? 1486?] G. L.

Bound in vellum.

Gift of Mrs. Sears.

Neither of the two preceding titles has been identified.